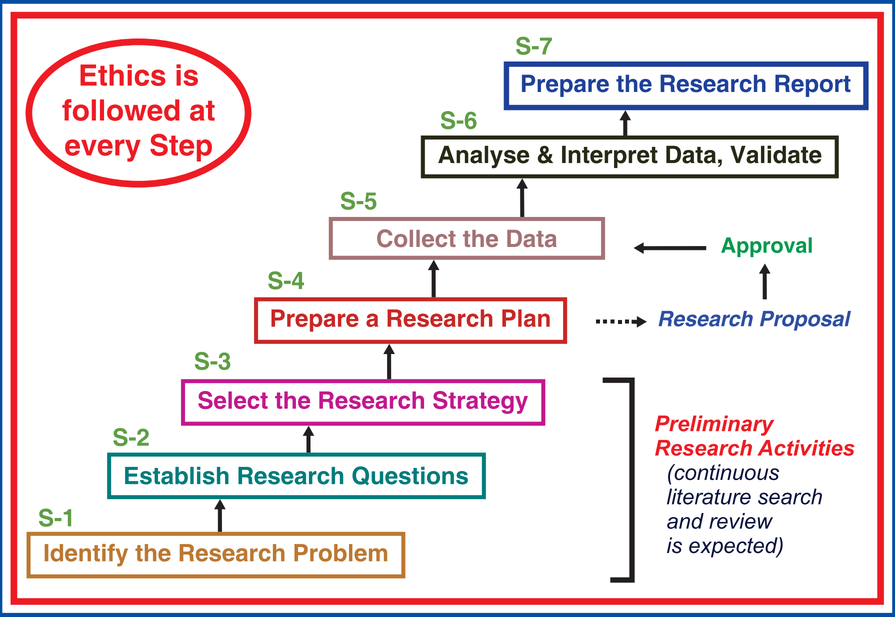
NUANCES OF THE RESEARCH PROCESS


Ethics is followed at every Step
S-7
Prepare the Research Report
S-6
Analyse & Interpret Data, Validate
S-5
Collect the Data
Approval
S-4
Prepare a Research Plan
Research Proposal
S-3
Select the Research Strategy
S-2
Establish Research Questions
S-1
Identify the Research Problem
Preliminary Research Activities
(continuous literature search and review is expected)

Vivek Patkar

NUANCES OF THE RESEARCH PROCESS

Vivek Patkar

Mumbai
March 2015

Nuances of the Research Process

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Dedicated to the next generation of researchers in my family:

Dr. Anuprita
Dr. Meghna
Dr. Shambhavi
Dr. Tejas
Dr. Chinmayee
Dr. Vikrant
Dr. Prasad

Other Books by the Author

Authored:

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Selected Writings on Transport (1997)

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About the Author

Dr. Vivek Patkar holds B.Sc. (Hons.) in Mathematics and M.Sc. and Ph.D. in Operational Research, all from the University of Delhi, Delhi. He was a Faculty of Quantitative Methods and Operations Management at the ICFAI Business School, Mumbai. Prior to that, he worked for 25 years as an Operations Research Specialist in the Planning Division of Mumbai Metropolitan Region Development Authority (MMRDA). He was involved in numerous schemes and projects pertaining land-use planning, infrastructure financing, and area & transport development. A comprehensive Regional Information System employing geo-referencing tools of Remote Sensing (RS) and Geographic Information System (GIS) for urban planning and management was established in MMRDA by the unit guided by him.

He is now an Independent Researcher and engaged in research on different aspects of the research. He has conducted several workshops on research methodology for both the natural and social sciences. Dr. Patkar is regularly invited as a resource person to the courses and seminars organised by the ICSSR - Western Regional Centre, and Departments of Geography, Mathematics, Statistics, Economics, Law, Computer Science and Civics and Politics of Mumbai University and its affiliated colleges and many universities and institutions in the country.

Besides eleven books to his credit are over 300 research papers and articles in reputed international technical journals, professional magazines and newspapers and other publications. His works are in diverse fields namely, mathematical programming, operational research, urban planning and development, GIS & computer applications, transport, telecommunications, library and information science, general management and social issues.

Dr. Patkar is a Member of the Editorial Board of the international journals entitled, *Human Systems Management* and *Journal of Geomatics*. He is a Member of the Monitoring/Steering Committee for Education and Content Development of the Rajiv Gandhi Science and Technology Commission.

He has voluntarily translated more than 50 booklets and other publications on cancer in English into Marathi and some in Hindi for an NGO namely, JASCAP - Jeet Association for Support to Cancer Patients (www.jascap.org). He is associated with a large number of academic and research institutions and professional bodies in India and abroad.

PREFACE

Research is a mainstay of the continuing modern development that touches practically all aspects of our life. No wonder it is valued for its immense contribution and is promoted by every sector of the economy apart from governments, learned societies and academic institutions. In the forthcoming knowledge society the nations with the know-how so generated are bound to prosper. To gain that edge and compete globally the country like India will have to go much beyond spreading and sustaining the literacy. Quality research, both fundamental and applied genre, will be necessary from the Indian researchers to achieve that objective. Building research competency is now imperative.

Research, by and large, is a systematic process of study that follows its own logic for the conduct, evaluation and dissemination of the results so found. Over the years a few subject specific methods have also emerged for carrying out the research. There are, however, some elements common to most of the research work, irrespective of the subject or discipline. Understanding those would help the researchers to explore any area of interest is our submission. In view of the availability of a large body of literature on various aspects of the research, this book is contained to a few key topics to reflect on some finer aspects of the research process. Research is an enjoyable activity once its process logic is understood and mastered. An avenue for the creativity and enrichment offered by the research is boundless is the foremost message.

In the last couple of years the author had conducted several workshops on the research methodology for both natural and social science faculties at different institutions and that covered the undergraduate, post-graduate and doctoral students and also the research supervisors. Further, in a leading Marathi newspaper, *The Maharashtra Times* a weekly column on research was run by the author during January to April 2007. Going by the feedback and suggestions received all those articles and some additional material were compiled, edited and brought in a book form in August 2007. That book entitled, “Sanshodhan-Margavaril Pravas” (means *Journey on a Research Path*) thus discussed quite a few facets of the research. It continues to evoke a good response especially from the researchers who are more comfortable with such literature in Marathi.

There has been a persistent demand to bring out a similar book in English to serve a wider section of the researchers. This book is a response to it. It is structured and written afresh. It is our belief that the treatment of the elements of the research process given here would help clarifying the basics of research. It is not a textbook on research methodology, but presents experienced-based discussions and suitable guidelines to facilitate researcher to proceed with renewed confidence.

The book can be used by all types of researchers. Exploring the field of research to promote its healthy conduct in this manner is a reward in itself to the author.

Mumbai, March 5, 2015 Vivek Patkar

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I am grateful to Prof. Gautam Gawali, Honorary Director and Dr. Mohan Prabhu, Former Director of the Indian Council of Social Science Research (Western Regional Centre), Mumbai for inviting me regularly as a Resource Faculty for the workshops and training programmes on the research methodology organised by them at Mumbai and other locations. Interactions with those participating research scholars and research supervisors have helped me markedly in shaping this book.

Dr. Surendra Jondhale, Professor and Head, Department of Civics and Politics, University of Mumbai gave me an opportunity to teach one full semester course on research methodology to M.A. Final students of his Department in the academic year 2011-12. That broadened my horizon. I am thankful to him.

I would like to express my thanks to the Principal, Vice Principals, Dr. Sagarika Damle and her colleagues from K. C. College, Mumbai for associating me continuously with their unique yearlong undergraduate level research activity called the Science Honors Program (SHP), which has been conducted creditably for more than ten years now.

Academic institutes in Greater Mumbai like S.H.P.T. School of Library and Information Science of S.N.D.T. Women's University, Thakur Institute of Management Studies and Research, N. G. Acharya and D. K. Marathe College of Arts, Science and Commerce, and Vidyalankar College and many more have invited me periodically to address their faculty, research scholars and students on conducting the research. I thank them all.

I am indebted to late Prof. A. C. Tikekar, Librarian and Head of Library and Information Science Department of the University of Mumbai and his succeeding professional and support staff members serving at Jawaharlal Nehru Library and Fort Library of Mumbai University for promptly supplying the documents for my various studies since 1978.

Going back further I would like to express my gratitude to my Ph. D. Supervisor, Dr. S. P. Aggarwal and co-researchers Dr. P. C. Saxena, Dr. Om Parkash and Mrs. Promila Agarwala of Department of Operational Research, University of Delhi, for innumerable discussions spread over 1975-78 period that helped me in understanding the practicalities of the research process.

I gained deep insights and wisdom from my co-authors, reviewers and editors in my research and publication accomplishments over the last 40 years. The list is too long to mention, but I am immensely indebted to every one of them.

Thanks are due to Mr. Yogesh Palkar and his team from Noetic Technologies for extending all the support to produce this book.

I cherish the memory of my eldest brother late Dr. Dilip N. Patkar who inspired me to tread the path of research by his own example.

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Chapter 1

Introduction to Research

1.1 Defining Research

For common understanding of any concept or entity it is necessary to define it suitably and uniquely as far as possible. Seldom do we realize that a simple or single delineation eludes for many entities in life. Defining the entity like ‘university’ is one such example. The term research also belongs to that category. In such situations one very old, but effective way is to identify ‘what it is not’ and the rest of the things are to be taken for defining its character. Please recollect how one decides about purchasing a shirt, dress or saree from amongst the large number of pieces available in a shop. By ruling out, say some colours, design types and certain price range the domain for selection is reduced to facilitate completion of the selection process in a reasonable time.

So let us apply this strategy by asking:

What Research is not?

A set consisting of the following answers can be considered adequate in general:

- Research is not just gathering of facts and figures.
- Research is not rearranging the facts and figures alone.
- Research is not playing of words.
- Research is not a sales gimmick.

In the light of these answers we can say the research

- starts with a problem or question,
- accepts certain basic assumptions or theories,
- requires unbiased data collection and analysis,
- expects critical interpretation of the results,
- performs validation,
- needs articulated documentation and presentation, and
- leads to further research.

It can be inferred from the foregoing that the research is a systematic activity full of rigour. A certain rationale is followed in its conduct. It is considered as a continuous activity and keeps studying the same phenomenon from different angles and at different times perhaps to revise the understanding.

Research could be undertaken for reasons ranging from contribution to the available knowledge to solve some practical problem. It would be interesting to understand the driving forces, reasons and aims for the research in reality.

1.2 Research Motives

The purpose or motive of the researcher drives the research activity primarily. It can sometimes be determined by the sponsoring or funding agency. Some motives could be:

a) Advancement of knowledge: Most of the academic research is propelled by this drive. The main intention is to build a reputation in the scholarly world by publishing say research papers and/or books contributing to the knowledge in a selected area. It is usually performed over a long time, perhaps spanning the career of a researcher in the academic institute.

b) *Commercial gain:* Research undertaken in a commercial organisation or sponsored by it is clearly commanded by the motive of financial gains through development of say new products and/or processes or improving the existing ones. It is usually a time-bound process and can be terminated anytime by the management considering the business environment alone.

c) *Policy formulation:* Undertaking or outsourcing research of this kind is done with the motive of obtaining suitable guidelines to frame or revise policies, programmes and projects. Government and international funding agencies is the largest group interested to support such research.

d) *Investigative reporting:* Motive for this type of emerging research, thanks to the proliferation of news and entertainment media, is to quickly translate the research-based findings in an attention-catching story involving a real life incident, for instance. Many media channels sponsor such research. On the other hand security agencies are motivated to do this kind of research for their own ends, which may be quite serious.

e) *Self-satisfaction:* This type of research is done purely for personal or inner satisfaction and no material gain is expected. For example research in Eschatology, which is the study of the end of the Universe falls in such a category. This research can be done at any time and all the time.

It is to be noted that the above motives are not mutually exclusive. That means the research can be undertaken with more than one motive too. For example, academic research can also have a commercial angle of obtaining a patent by the researcher besides scholarly publications. In principle there is nothing wrong in such motives and thinking. Apparently that depends on the mindset of a researcher and sometimes on the nature of the subject matter. Mathematics for the sake of mathematics drives a sizeable number of researchers in the field of mathematics even today illustrates the point.

1.3 Research Focus

Researcher can concentrate on one or more of the things like:

- Generating novel, but useful ideas.
- Learning to challenge the existing knowledge.
- Using creative capacity to discover or invent something new including concepts, theory and interpretation.
- Bringing a new creation to fruition like new indicator, evaluation scale or equipment.

Generally a researcher studies the problem from one subject or discipline mastered by him or her. Most of the real life problems however have multiple dimensions. The focus of a professional researcher, particularly latter in the career, is to approach the problem from various viewpoints. In technical terms it is called conducting the research by *multidisciplinary* or *inter-disciplinary* approach. Under the multidisciplinary or trans-disciplinary approach the problem is analysed from a number of disciplines simultaneously or one after the other, but remaining within their separate boundaries. In the inter-disciplinary approach transgressing the subject boundaries for the study is envisaged. Obviously such high order research work requires tremendous experience and, therefore, the candidate working for the doctoral degree should not usually select such approach is the advice.

1.4 Specific Research Aims

In practice the researcher can launch the research with any of the aims identified as follows:

- To understand the properties of the given phenomenon e.g. why the voter-behaviour changes in a short span of time in some constituencies.
- To establish relationships between variables e.g. determine the links between the income and expenditure on tourism and entertainment activities.
- To predict the outcome e.g. use of theory and analysis to predict prices of the select shares over a few next weeks.
- To replicate research for validation e.g. confirm or refute certain new theories advanced by other researchers say about managing the classroom in a primary school more productively.
- To develop new procedures or products e.g. to produce and test a new algorithm by implementing it on different computer systems for its efficiency and robustness.
- To produce a theory e.g. to subject new ideas to rigorous testing and propose a new theory in respect of a natural or social phenomenon.

1.5 Importance of Research

In the forthcoming knowledge economy era the status of a nation would be determined by its knowledge resources and contribution to the knowledge. Continuous creation of new knowledge and its strategic use would be the key factors to compete and grow for both individuals and countries in future. Research of high quality will be the backbone in this regard. To develop the research skill would therefore be imperative.

To nurture the inquisitiveness and research aptitude at all levels of education is one essential prerequisite in that milieu. The other is to extend necessary facilities and environment to do the research. Natural talent and capacity alone cannot deliver the quality research output; they are to be properly developed and valued. It is said that Isaac Newton got the idea of gravitation by observing a falling apple. This may or may not be true, but two very important aspects related to it are often overlooked. One is the fact that Newton had received systematic training at Cambridge University, U.K. to think critically that is so necessary for conducting the research. And the other is that he pursued his observation through awe-inspiring efforts to bring it to its coherent end. Otherwise, apples had been falling for ages before him!

The nations promoting and honing the research skills among students right from the school level are reaping the benefits. They are constantly reshaping their courses, courseware and teaching methods to suit the demands of time. Institutes of higher learning are periodically restructuring their research programmes to maintain the edge.

A country like India will have to double up its efforts in this regard. Short-cuts would not help. Research useful for solving the problems faced by the community or society, which would also usually result in significant contribution to the knowledge and practice should receive the highest priority. Importance of research should not be undermined is the point.

1.6 Structure of the Book

There are 18 Chapters in the book including this Chapter. Matter in each Chapter is organised in Sections and Sub-sections. An overview of the Chapters is given below.

Chapter 2 presents aims of the research at an individual and institutional level. Various ways to classify the research are further described. Basic concepts constituting the research hierarchy are discussed in Chapter 3. The research methodology framework incorporating research design and research strategy presented here gives fair idea about the conduct of the research. Characteristics and steps of the research process are detailed in Chapter 4. How to locate a problem for the research is first discussed in Chapter 5. Rest of that Chapter describes the process of transforming the problem into suitable articulated research questions, which prompts the further steps of data collection and analysis. Examples are given to illustrate this process.

Research elements like variable, hypothesis and theory are elaborated in Chapter 6. The concept and characteristics of hypothesis are discussed at length and procedure for testing a hypothesis is outlined. How to do literature search both print and digital types is described in Chapter 7. Various search strategies are discussed in this regard with examples. Chapter 8 deals with the review of literature. Focus, core contents and steps involved in the review of the literature for research are presented to guide a researcher.

Methods commonly used for performing quantitative and qualitative analysis are highlighted in Chapter 9. Sampling plays very important part in survey-based research. The concept of sampling and various methods for sample selection are therefore described in Chapter 10. Questionnaire is one of the major instruments in the research and that is why entire Chapter 11 is devoted to it. Structure of a questionnaire and strategies for its design are discussed in-depth there.

Validation is a critical element of the research. Various aspects of research validation and standard methods employed for this purpose are presented in Chapter 12. Research writing varies with the document type to be ultimately produced. Chapter 13 in particular provides detailed guidelines for preparing research proposal, thesis and research paper. In addition it outlines the publication process to disseminate the research results widely.

Ethics needs to be followed strictly in research. One must be aware that it could be violated at any step of the research. Chapter 14 gives insights and practical advice about the actions to be taken to follow the research ethics. Chapter 15 presents the concept of good research. It further provides guidelines to improve the quality of the research and its presentation. It is obvious that certain skills must be available for performing quality research. What are they and how to develop them is the focus of Chapter 16. Large-scale research is considered as an industrial activity and is to be managed professionally. This aspect of management of research in practice is discussed in Chapter 17. Experience of the author regarding different aspects of the research activities is presented in Chapter 18 to serve those entering the world of research.

A Bibliography of the select books is given at the end for the interested reader. Some of them are cited at appropriate places in the text.

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Chapter 2

Aims and Types of Research

2.1 Basic Aims of the Research

In the broadest sense the aim of most of the research work is to contribute to the existing body of knowledge and advance it in as many dimensions as possible. This also involves research-based practice advancement in professional fields like medical and paramedical, architecture, management and jurisprudence. The research aim could thus be described for example, as

- substantiating an existing theory
- clarifying contradictory findings
- revising a faulty methodology
- applying new techniques
- unifying various opinions
- solving the existing problems
- developing better algorithms or methods
- explaining new phenomenon
- introducing new practices
- producing training tools
- disseminating or publishing the results for wider consumption and discourse

A combination of the above aims is also pursued by many researchers. It can be said that the aim of the academic research is usually confined to enrich the knowledge, whereas, developing new methods for solving a pressing problem of practical import is often the aim for conducting the research in other spheres.

2.2 Research Aims of Individuals and Institutions

2.2.1 Individual

Nominal aim for the researcher in first instance is to obtain a *research* degree like M.Phil. or Ph.D. For a large number of researchers that is the end in itself. They may aim at some other activity next where they may use the experience of systematic logical working gained through the research to their advantage. They are perfectly justified to do so.

On the other hand for the committed researchers obtaining the research degree is a starting point. They want to go long way on a chosen path of the research and to make more substantial contribution to the field of their interest. After crossing the first milestone of obtaining the desired degree and experience of doing research they chart a new path. Quite often they set up a three to five year research programme to reach at certain state of knowledge in the chosen field or address a set of unsolved issues. Then they commence work on such a programme by dividing it in suitable part-themes or projects to be undertaken by themselves and/or by their students. Building academic reputation and authority in this manner is the concurrent aim. Publishing, patenting and advising are the mainstay activities for this purpose. There is nothing wrong in it unless the means employed to achieve the aims are unethical and not befitting the standards of a research endeavour.

Research aims of an individual researcher generally vary with time and career advancement. For example, performing multi-disciplinary research in the latter part of the career could be the aim. More often than not the aims of a researcher are aligned with that of the employing institution.

2.2.2 Consultancy Firm

To complete a research-based assignment or consultancy task that offers significant revenue is the aim mostly pursued by the consulting firms. They usually take this perspective for their research portfolio. The aim of continuing research and study a theme on a long term basis is not considered suitable by them. The research topic arises in *ad hoc* manner as per the client's needs. It is confined to solving a given problem and terminated on its accomplishment is the general policy.

Of course, there are exceptions and a few consulting firms invest in the medium or long-term research in certain areas, but the aim is to gain commercial advantage. Developing new algorithm and/or software package is one such activity undertaken by them, for instance.

2.2.3 Corporate Establishment

Research aims of the big establishments are governed by several factors. For instance, research and development organisations of the government (like the DRDO - Defence Research and Development Organisation of India) and large *for-profit* businesses (like Tata Motors) usually set tangible aims for their research. Their aims could be to produce new products, processes or services within a specified time. Primary aim is to gain certain level of monetary returns or advantage by this process. So they can abandon the research if the progress is not considered satisfactory on this count. The aim of deriving practical utility drives such research mostly.

2.3 Types of Research

It is interesting to note that aim of the research is many times guided by the nature of the subject or discipline. Research is accordingly classified as discussed below.

One of the standard methods for classification of research is to divide it in pure and applied types. It has been more common in science and mathematics. For centuries research contribution in science was looked from these two categories alone. Theoretical research is termed as fundamental, pure or basic research. The work of Albert Einstein in physics falls in this category for example. Applied research is considered more concerned with the application part. Most of the work by Michael Faraday in chemistry falls in this category for instance.

Two major aspects are considered for classifying the research in the modern context namely, knowledge advancement and direct application. So for a given piece of research one question is asked whether that research advances the basic understanding, and the other question is whether it is relevant or useful for any immediate application. Based on the answer to these two questions (either 'yes' or 'no') the following four categories of research are formed:

1. **Pure Basic Research:-** It implies the research definitely advances the basic understanding, but no immediate application is envisaged. The research work in quantum mechanics (physics) and number theory (mathematics) is its example.
2. **Use-Inspired Research:-** It implies contribution to both advancement of basic understanding and immediate

application. The research in microbiology (life science) and operational research (mathematical science) falls in this category for example.

3. **Pure Applied Research:-** It implies immediate application and advancing the practices, but not contributing significantly to basic understanding to advance the knowledge. The research in the engineering field is of this type in general.
4. **Classification Research:-** It neither adds to the basic understanding nor supplies immediate application per se. Classification of species or astronomical objects falls under this type of research,

It is seen that research in science and technology fields could be easily classified in the above manner. Note must be taken of the fact that all these four types of research are of equal importance for the advancement of humanity. Even the fourth type namely, classification research has played a vital role for example, the classification of elements in the original *Periodic Table of Chemical Elements* clearly indicated the existence of some elements and guided the search for them. Research in the recreational mathematics falling in this category does play very important role to support teaching.

With the advent of computers and the Internet a third category of research called electronic or virtual research has emerged in the last few decades. It combines both pure and applied research in the cyberspace and facilitates performing experiments in the simulated environment rather than in the physical space. It provides a flexibility to build and test theories without bounds. No wonder this type of research is gaining popularity in a large number of subjects falling under the science and social science.

2.3 Other Ways to Classify Research

The research in social sciences and humanities can be classified by its aim in the following manner:

- Extension or generalisation of the currently available results
- Explanatory (why), finding the reasons by building theories and hypotheses and testing them
- Descriptive (what, where, who and how), leading to prescription
- Comparative study
- Life history research
- Predictive (estimating future values)
- Evaluation study (effects of certain action)
- New / Improvement of process or product or service
- Benchmarking study (long term evaluation of a product or service)

2.4 Impact Assessment Study

This is another type of research that has emerged in recent years. Such research could be called as policy-linked research. It is generally commissioned or sponsored by any agency to evaluate the impact of certain policy, programme or project. Government and international lending agencies like the World Bank fund these types of research studies. They typically involve evaluating the impacts of the following types:

- Economic: changes in say wages, employment and land values
- Demographic: changes say in sex ratio and age structure of the population

- Fiscal: changes in public revenue earning through say sales tax and property tax
- Community: changes in the demand of say housing, education and transport facilities
- Social: changes related to displacement, leisure activity and crime in a given area
- Environmental: changes observed in say quality of air, water and noise in a given area

2.5 Online Research

Conducting research about the electronic media is one type of research that is now emerging. For instance impact of the Internet or social media on various human activities is a part of such research.

On the other hand employing the on-line research tools of social media for conducting surveys is forming new type of research activity.

Thus the online research can be typified as,

- Use of research methods to study different aspects of the Internet
- Using the Internet to apply research methods for addressing the research questions
- Undertaking collaborative research
- Using tools like online surveys & interviewing, online focus groups, virtual ethnography

Remark 1: Refer the following web sites in this regard:

http://www.survey.bris.ac.uk
http://www.ssoar.info/
http://www.oii.ox.ac.uk/microsites/oess

Remark 2:

Exploratory research is another type of research. It is usually done to firm up the research elements like variables and hypotheses and it is recommended to undertake it before firming up the research proposal. Sometimes the exploratory research reflects fathoming the new or virgin research area.

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Chapter 3

Research Development Framework

3.1 Research Conception Hierarchy

The following five elements constitute the basic hierarchy to guide the research development in practice: 1) ontology, 2) epistemology, 3) methodology, 4) methods and 5) data sources. These elements are discussed below.

3.1.1 Ontology

Ontology refers to the fundamental question directing any research namely: What's out there to know? In other words assumptions about the nature of reality are to be spelled for the research under consideration. The ontological perspective of the researcher can shape her or his research process. For instance, outsider or insider view to study a given phenomenon is determined by it and accordingly the next steps are carried out.

The following are the foremost classes of ontologies:

- *Shallow ontology:* what we can observe is what exists, and is all that exists; challenge is to observe and describe any natural or social phenomenon.
- *Conceptual ontology:* reality exists independent of human mind; it can be known only by human capacity of thought and reason.
- *Cautious ontology:* there is an independent reality, but beyond human capacity to perceive it accurately; act of

observing is an interpretive process.

- *Depth ontology:* reality consists of three levels – the empirical, the actual and the real; phenomenon can be explained with reference to underlying structure and mechanisms.
- *Idealist ontology:* reality is what created by human beings; social reality consists of the shared interpretations produced by actors.
- *Subtle ontology:* an external social reality exists; knowledge defined as beliefs whose validity is known with certainty is not true.

3.1.2 Epistemology

Next question emanating from the ontology is: What and how can we know about it? This means epistemology is concerned with a theory of knowledge and a theory of knowledge acquisition. The way in which knowledge can be obtained are to be delineated is the implication.

The following are the classes of epistemologies corresponding to the ontologies outlined above:

- *Empiricism:* knowledge is produced by use of human senses and experimental methods (linked to shallow ontology). It implies that absolute knowledge can be obtained.
- *Rationalism:* direct examination of the structure of thought is the only way; logic and mathematics are to be used (linked to conceptual ontology). It also implies that absolute knowledge can be obtained.

- *Falsification:* theory is to be created and tested, if refuted it is to be revised and if it withstands, it is to be accepted temporarily (linked to cautious ontology). It implies that only tentative knowledge can be obtained.
- *Neo-realism:* locate and explain structures or mechanism that produced the patterns or relationships (linked to depth ontology). It also implies that only tentative knowledge can be obtained.
- *Constructivism:* social reality is a structure of ideas constructed by individual or group (linked to idealist ontology). It implies that knowledge obtained is relative in nature.
- *Conventionalism:* theories are created as tools and accepted if they produce desired results; reality is a consequence of the theory that is used. It implies that utility is more important.

3.1.3 Methodology

Next logical question is: How can we go about acquiring that knowledge? The answer is directly linked to the ontological and epistemological stance taken. For instance if one adopts shallow ontology and related empiricism epistemology then the methodology would involve studying the phenomenon from the outside to arrive at the definite answer. A commonly used research methodological framework is described in Section 3.2.

However, different methodological frames are available depending on the choice of the ontology and epistemology for studying a given research problem.

3.1.4 Methods

The further linked question for conducting the research is: Which precise procedure to use? This means particular method best suiting to answer the research question from among the vast assemble of research methods is to be selected.

The selection of specific technique under survey methods, case analyses, grounded theory, hermeneutics, ethnography, phenomenology, and action science for example is expected.

3.1.5 Sources

To launch the research process the next question logically is: Which data can we collect? The appropriate data could be primary or secondary in nature depending on the research problem and selected methodological approach.

Primary data collection would involve conduct of field surveys or laboratory experiments employing well tested instruments. Secondary data collection would involve desk research of collating relevant information from various resources and subjecting it to the analysis by say techniques like content analysis, data mining, text mining and web mining.

Remark: A literature review considerably helps in appropriate selection of the above five fundamental elements for undertaking research on the identified topic say from a new perspective.

3.2 A Research Methodology Framework

In real life the research methodology framework employed in general is described in Figure 3.1. According to it the research is initiated by identifying problem, its articulation into researchable questions and/or hypotheses and identification of the research strategy. Setting up suitable experiment, collection of data and performing the analysis constitutes the following phase. Results thus obtained are to be validated and critically interpreted next. Writing and presenting the results for consumption is the final phase. Continuous search and review of the literature is expected till writing the final draft. And, at every phase it is to be ensured that the research ethics is not violated.

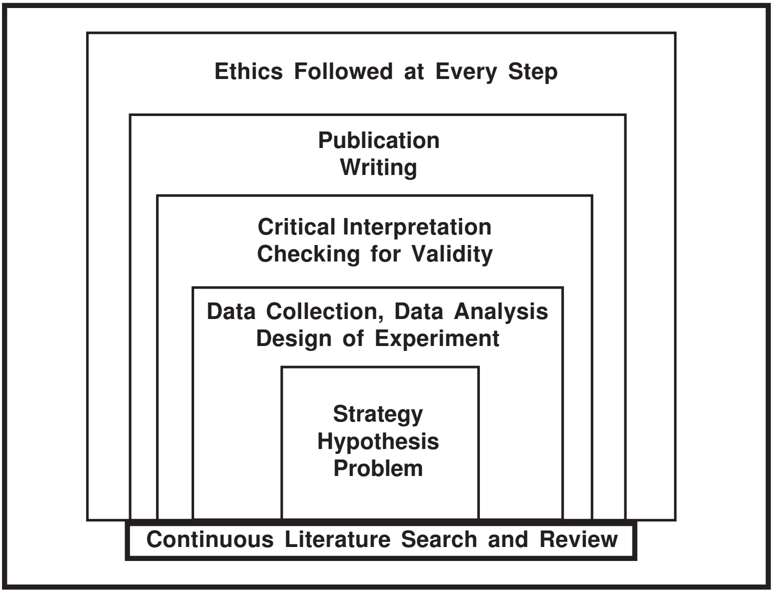

Figure 3.1 A General Research Methodological Framework

3.3 Research Strategy

Research strategy is a well-conceived approach to research determined by the kind of question that the research study hopes to answer. There are four types of research strategies as discussed below.

3.3.1 Inductive Research Strategy

Its three principles are:

- *Accumulation:* knowledge grows by the addition of further well-attested facts.
- *Induction:* from valid statements describing observations, valid generalisations can be inferred.
- *Instance confirmation:* belief in the validity of generalisation increases with number of instances that have been observed.

3.3.2 Deductive Research Strategy

- Put forward a hypothesis that helps building a theory.
- Deduce conclusions (perhaps with the aid of previously accepted hypotheses).
- Examine critically the logic of argument in the theory (and see whether conclusions advance the knowledge).
- Test the conclusions by gathering appropriate data.
- If data are not consistent with the conclusions, the theory is judged as *false*, otherwise, *temporarily supported* (but not proven).

3.3.3 Retroductive Research Strategy

- Explain observable phenomena and regularities; attempt to discover suitable arrangements (structures and mechanisms).

- Construct a model of them.
- If model correctly represents the arrangement, the phenomena would be causally explained.
- Test further consequences of the model.
- If tests are successful, existence of the proposed arrangement is acceptable.
- Repeat the whole model building process to explain known arrangements.

3.3.4 Abductive Research Strategy

- Aim is to derive expert accounts of social life from the everyday accounts of social actors.
- Capture the meaning and intentions which direct behaviour of the people.
- Describe this inside view and do not impose outsider views.
- Turn the lay descriptions of social life to technical descriptions of social life.
- Develop a theory or theories; it is like grasping the unknown whole from the known parts.

[Refer Sr. No. 5, 19, 24 and 37 under the Bibliography for the detailed treatment regarding the above sections]

3.4 Research Design

3.4.1 Purpose

Research design is a specific plan for implementing a research strategy. It serves in the following manner:

- ‡ It guides the process of collecting, analysing and interpreting observations.
- ‡ It also helps in determining whether the obtained interpretation can be generalised to a larger population or to a different situation.
- ‡ It generally aims at eliminating as many alternative explanations for a phenomenon as possible.
- ‡ It provides a built-in system to check the factors that may affect validity of the research outcome.
- ‡ It depends on the type of research, time and money.

The research design is prepared according to the overall research strategy. It is categorized in two types named quantitative and qualitative research design as described next.

3.4.2 Quantitative Research Design

Exploratory Designs:

- ♣ Their objective is to get insight about the research problem (like pilot studies).
- ♣ They use small-samples.
- ♣ They help to evaluate the importance of variables in the study and drop those related marginally.
- ♣ They help in hypothesis formulation and testing.
- ♣ They envisage data collection from both primary and secondary sources.

Descriptive Designs:

- ♣ They aim to obtain an extensive picture of the phenomenon using a large sample.

- They encompass either field studies to probe a few issues in-depth or more popularly field surveys for broader coverage.
- They suggest *cross-sectional* studies as one-shot assessment of a sample of respondents, which could be divided in different classes say, by income, education and gender.
- They also cover *longitudinal* studies using panels of the same participants over a time period to assess the change in response and measure it.

Causal Designs:

- They are relational (how one or more variables are related to each other)

or

- They are experimental to know cause or causes of change in a variable or event (what leads to what)
- They call for deployment of elaborate tools from statistics labelled as *Design of Experiments* depending on research problem and environment.

3.4.3 Qualitative Research Designs

Explanatory Designs:

- They are used primarily for providing description as well as meaning of the phenomenon.
- Prediction is also their goal.
- They suggest use of simple statistical analysis for explaining difference in responses from say two or more groups of respobents.

Interpretive Designs:

- They aim to establish a meaning to an event or social situation.
- They largely concentrate on norms, standards, rules and values that are held in common and how these all influence human interactions for a given study.
- They incorporate study of symbols, artefacts, beliefs or meanings attributed by people in the study situation to describe and explain the phenomenon in greater depth.

Critical Designs:

- To change people's belief is the overriding objective of these designs.
- They also aim to bring people to actions that are commensurate with accepted truth and goodness.

Critical designs are being increasingly used in the research in the areas of public administration, sociology and education.

3.4.4 Practical Implementation

In sum the research design is a blueprint that details the actual steps of the research in practice. It describes data gathering strategy according to the chosen design, sample size and sample selection method, instruments that would be used (like questionnaire or interview schedule, passive or participative observations and desk study) and a justification for selecting a particular method. Ethical issues that may be involved and how they would be dealt with is also stated explicitly in such a document.

In real life it takes a shape of a research proposal (refer Chapter 13 for preparing the research proposal). A research proposal is submitted to the concerned academic and/or funding agency for the approval. It may be revised in the light of the suggestions received. It is then frozen and conduct of the research is further steered by the finally approved proposal.

3.5 Research Procedure

Research procedure is an exact, step-by-step description about performing the research. Each discipline has evolved a set of techniques and best practices in this regard. For instance social science studies usually deal with human actions and behaviour and commonly employ the following procedures of enquiry:

- Survey (field observations of rituals, say)
- Questionnaire (soliciting views on issues)
- Interview (individual or group)
- Content analysis (study of historical documents)
- Statistics (descriptive and inference drawing)

Further elaboration on the research procedures can be found in Chapter 9.

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Chapter 4

Research Process

4.1 Research Process

Research is a continuous process. The committed researcher is expected to enhance the quality of his or her research all the time. It is like the high jump contest of the sport where the bar is raised once the previous height is scaled cleanly. Of course, it is possible that some other researchers can carry the research further like the relay race contest of the sport. It is therefore important to understand the elements of the research process and the steps involved to conduct the research proficiently in practice.

There are some basic aspects that characterise the research process in general. The process is carried out systematically and within the available time and other resources as far as possible. Given below are a few major elements defining the research process.

- It is confined to the study of a well-defined problem. The selected problem may be a small part of a bigger problem or issue.
- It is by and large a linear process. That means the next activity starts when the previous one is over or nearing the completion. For example, unless data is collected it cannot be analysed and interpretation cannot be made until the analysis is over. A few activities can however happen in parallel like designing the questionnaire and

selecting the sample can be done alongside.

- It involves in-depth analysis and validation. All the collected data are expected to be analysed exhaustively. That also means unnecessary data are not collected in the first instance. Moreover the results so obtained are to be validated using several methods available for this purpose. Consulting a few experts in the field is one of them.
- Its outcome is to be interpreted within the data limits, but critically. The researcher is expected to limit the generalisation of the results to a reasonable extent. Having collected the data for twenty years and making prediction for the next fifty years or results of the study about reading habits of a few college students in one town in India should not be projected as representing all college students in India.
- It provides clear verdict on the problem. The conclusions drawn by the research are expected to provide unambiguous directions to move further, subject to data and other limitations.
- It is transparent. There are no hidden elements in the conduct of the research. For instance the methodology details and instrument used for the study are provided in the research report so that others can replicate the study easily, if desired.
- It is often cumulative in nature. Research process generally ends by adding a new piece of knowledge to the existing body of the knowledge on that topic. It also points to new areas for research and thereby contributes to the continuation of the accumulation activity.

4.2 Research Steps

The seven steps numbered from S-1 to S-7 in Figure 4.1 outline the majority of the activities defining the research process. Their details are given below. The linear nature of the research process is clearly illustrated by this figure.

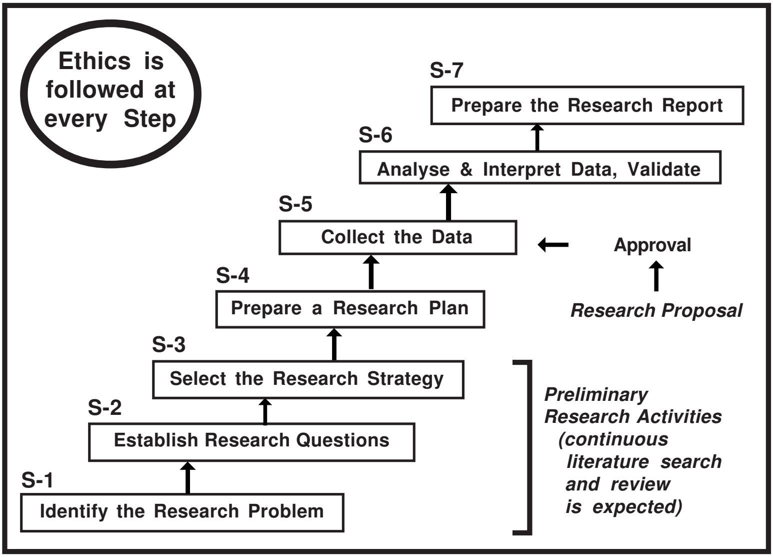
Ethics is followed at every Step
S-7
Prepare the Research Report
S-6
Analyse & Interpret Data, Validate
S-5
Collect the Data
Approval
Research Proposal
S-4
Prepare a Research Plan
S-3
Select the Research Strategy
S-2
Establish Research Questions
S-1
Identify the Research Problem
Preliminary Research Activities (continuous literature search and review is expected)

Figure 4.1 Major Research Steps

S-1: Identifying the problem is the first step of the research. It can be done in several ways. One standard practice for the doctoral research is to review the available literature like previous doctoral theses or publications around some theme in mind and take it further in new direction or subject it to new tools of analysis and interpretation. This helps in identifying the problem broadly.

S-2: Articulating the identified research problem in the researchable question is the second step of the research. This helps in drawing the boundary of the problem that could be studied in reasonable time. In other words the aspects of the problem to be examined get well defined. Next part is to break this central question in a number of relevant sub-questions that can be studied in minute detail. Results of those efforts could be integrated ultimately to comment on the central question. This *divide and solve* strategy is very effective in completion of the research satisfactorily.

S-3: At this step an overall strategy to conduct the research is framed. It includes deciding about the methodological approach like quantitative research, qualitative research or mixed methods for say a social science research problem. Based on that decision the particular method or technique to be used is identified.

S-4: How the study would be conducted, the strategy for analysis and validation are to be identified and documented in the form of a research plan at this step. In practice it is submitted as a research proposal to the research approval body of the academic institution or funding agency. Structure and content details of such research proposal are given in Chapter 13. The research proposal may be approved as it is or may be revised as per the received suggestions.

S-5: The approved research proposal now acts as a blueprint for carrying out research. At this step the data collection activity is launched according to the accepted procedure like say field survey or laboratory experiments. Proper notes and documents regarding this part are to be maintained for future consultation and writing part.

S-6: Collected data and observations are analysed at this step employing the identified tools say from statistics or critical interpretation. Specific and broad interpretations are to be drawn for the sub-questions and the central question, respectively. Those are to be validated by the standard methods of research validation. For example, literature supporting the results could be searched for this purpose.

S-7: Writing a Thesis or Research Report is the final step of the research process. Structure, content details and writing guidelines for such documents are given in Chapter 13.

The steps S-1 to S-3 of the research process are known as the 'preliminary research activities'. It may be noted that literature search and literature review are the activities that are continued till the last draft of the thesis or report. The research proposal formulation is informed and shaped to a considerable extent by the select literature review completed at that stage. In most of the doctoral theses there is a separate Chapter on the literature review to identify the gaps in the existing knowledge and delineating the scope of the work.

Attention is drawn to another important point shown in Figure 4.1 about following the ethics at every step of the research process. Yes, ethical norms in research are very important and they can be violated at any step – even in the literature search and review. The issue of research ethics is discussed at length in Chapter 14.

The action of sub-dividing the problem or research question into sub-questions to be performed at the step S-2, is the key. Once this procedure is mastered the research becomes quite smooth and enjoyable is our experience. This procedure is illustrated by examples in Section 5.10 of Chapter 5.

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Chapter 5

Research Problem Formulation

5.1 Starting Point

For most of the new research students where and how to search a problem for the substantial research is a big challenge. There is no formula or recipe for it however. One has to continuously read, observe and discuss the thoughts with experts and senior researchers for this purpose. Research at its core is a creative process. And creativity is not bound by the rules, it can happen spontaneously too. So a research idea can strike in any manner. Even a trifle incidence or dream can be a vital spark. Given below is a sample of such triggering points. To pursue that impetus systematically in the framework of the research process described in Chapter 4, however, needs training and uncompromising efforts besides singular devotion. Newton's story from Chapter 1 may be recalled in this context.

- *Curiosity:* Why the things are happening as they are can motivate the researcher to build and test the theories for example. This, perhaps, is to be learned from the children who pester the elders with their curious questions all the time! Unfortunately, by the adulthood many of us lose this trait.
- *Dissatisfaction:* Human beings generally tolerate many inconveniences in the daily life that are caused by the given products, process or services. How can those be improved, marginally or radically, can lead the thought process in researched-based new developments. Again our tendency to

compromise with even grossly unsatisfactory things can hinder this process.

- *Unorthodox idea:* It is usually called as out of box thinking. An unconventional idea, if taken to its logical end, can achieve unprecedented success. For example, a process to mend the broken egg by stitching can bring in enormous benefit because thousands of eggs are broken while transporting. However, pursuing such idea is full of uncertainty and, therefore, not encouraged for the research work aimed to obtain the doctoral degree.

5.2 Locating a Problem

There are however quite a few conventional methods to locate a problem for the research as outlined below.

a) *Generalisation:* This is the most common method for identifying the problem for research in academics. It attempts to enhance the scope of some available study of the past or replicate it in some other region or context. Doctoral research study, especially in social sciences, follows this approach because it could be completed in comparatively less time. It is clarified that there is nothing wrong in this method as generalisation of the existing results helps in building theories ultimately. In the field of mathematics generalisation of previous results by reducing the number of assumptions is considered quite significant indeed.

b) *Cause and Effect:* This method works in two ways to initiate the research. Under the one, some actions are initiated and their effects are studied. For instance, a special training is given to the select workers in a factory and its effect on their productivity is estimated to evaluate the suitability of the training (other influencing factors are controlled). Under the reverse approach causation factors for the observed phenomenon are identified and their contribution is estimated. For example, what are the main causes leading to the obesity observed in urban school children in the 12 to 16 years age group, could be investigated. Some researches can use both these steps in cycles.

c) *Paradox and Contradiction:* There are several mismatches apparent in the societal transactions, which serve as the focal point to start the study. Despite the bumper crop in a country, starvation deaths continue is one glaringly sad example of this phenomenon.

d) *Perspective and Scale:* Building perspectives about any phenomenon or issue from different observation points can help to start the research. For example, managerial competence from the gender, education and family background viewpoint could be taken up for the study.

e) *Reengineering Option:* To initiate building entirely new system to replace the existing one instead of tinkering with it to make marginal changes is the stand here. It is a welcome approach in many instances and often opens up new opportunities. Designing a virtual classroom teaching system to serve the areas where conventional teaching system is not viable could be considered for research is one example.

5.3 Other Ways for Problem Identification

5.3.1 Some Sources

‡ Fancy for some topic arising out of the study say, during the post-graduate stage

- Observation of shortcomings of the existing theories
- Literature review to notice that a certain field or types of problems are not covered
- Drawing on life experience of own or others
- Historical incidence
- Item in the news
- Eye-witness
- Local issues
- Community, country or a region specific phenomenon
- Guide or Supervisor's research programme
- Cyber inspiration say, from the blogs

5.3.2 Topic Selection

Factors to be considered while selecting a topic for the academic research are:

- *Relevance to the time and institution:* a study of the problem of current importance and of use to some institution receives a support.
- *State of the current knowledge:* a problem which has reached almost a saturation level by the work done by others should be avoided. Discussion with the experts in the field can prove useful in this regard.
- *Emerging area:* a future oriented problem is most welcome because the relevance of the research gets appreciated over the years and the researcher gets the benefit. Selecting a problem which is on the verge of obsolescence should be avoided. Again the guidance of experts in the field would provide useful.
- *Data expediency:* a problem should not be selected, at least by the new researcher, for which obtaining the data and

quoting the source is not possible. For a research document ensuring this condition is essential. Research on such topic for example, corruption is no doubt very important, but to conduct it requires very complex methodology that is beyond the new researcher.

- *Guidance and necessary facilities:* it can happen that a guide with expertise in some areas or topics may not be available or necessary facilities like equipment or advanced computer system at a given location. In that case one option is to relocate to the institute where such facilities are available, while the other is to change the topic.
- *Personal confidence:* the researcher should feel confident that he or she has adequate training and environment to complete the work in a reasonable time period such as three to four years for the doctoral research.

Additional factors to be considered for the research-based consultancy work are:

- *Practical utility:* the end results of the research must serve the sponsoring agency's requirements as documented in the Terms of Reference section of the consultancy agreement.
- *Time availability:* the scope of the work should not be so wide that time overrun can occur and the results may be overtaken by the events.
- *Financial viability:* the nature of problem should be such that research consultancy costs can be estimated fairly accurately in advance to remain financially viable.
- *Moral obligation:* the ethical issues regarding the conduct of research on a given problem and its consequences should be weighed before taking the decision.

5.3.3 Problem Pointers

For an in-depth research the following aspects of the identified problem are considered very important:

- The problem is the outlook the researcher
    - worries about,
    - thinks about constantly, and
    - wants to find a solution for.
- The purpose is to solve the problem, means to
    - find answers or strategies, and
    - provide at least a plan for the implementation, wherever applicable.

Examples of some problems of the societal concern:

1) Suicides in recent years by the farmers in different parts of Maharashtra (why?)
2) Commercialisation of higher education in India (what are the impacts?)
3) A digital divide prevails in the Indian society (how to bridge it?)
4) Social capital in the urban areas helps the migrants (what is the mechanism?)

5.4 Idea Development

The research idea needs proper development and articulation for taking it further. The literature available in print, microfilm and digital forms should be searched systematically for this purpose. Help and guidance of the subject experts and library and information science professionals should be taken for this purpose. Get systematic training, if desired for browsing electronic resources so that efforts are optimised. Refer Chapter 7 and 8 for literature search and review, respectively in this regard.

Take the following actions:

- Visit as many university and research institution libraries as possible. Take notes about the available pertinent resources like journals, research books, microfilms and e-books and electronic resources in each library or information centre.
- Refer the abstracting journals like *Sociological Abstracts*, *Chemical Abstracts* and *Mathematical Reviews* and also the documents giving information about the doctoral thesis like *Dissertation Abstracts* and *Shodhganga.*
- Do the Internet search; scan pertinent *blogs;* note their addresses called URLs (Uniform Resource Locator) and also the date of browsing.
- Identify the major authors and contributors. Get in touch with them. Request them for their works and promptly acknowledge the receipt and send your observations or questions to them for clarification. Network building is quite important in the research.
- Locate the institutions specific to the area of the study. Enroll for the membership of the prominent professional associations or societies so that latest development in the field could be obtained.

5.5 Initiation

Based on the literature review and discussions with experts a broad plan for the research should be prepared. This is largely for the self-consumption. But it can be developed in the full blown research proposal by expansion and articulation.

First task here is to outline the general context of the problem area. Issues about that problem to which answers have not been found up to the present, should be discussed next. The contextual significance of the problem should also be discussed. It provides a proper setting for the problem under consideration and informing the stand or perspective that the researcher would take.

In that context discussion about the concepts and ideas current about the problem in the literature should be presented. That would also involve enlisting basic underlying assumptions and key theories regarding the problem.

Finally write down the identified important issues and specify precisely on what is to be solved or resolved and the expected form of the results.

To proceed further the problem is to be articulated and converted in the researchable form as described in the following sections.

5.6 Problem Statement

Though looks trivial the statement of the problem should display the following features:

- ☐ Grammatically correct form
- ☐ Complete, unambiguous and well-articulated

- ☐ All the technical terms are suitably defined
- ☐ Amenable to division in sub-problems for better management of the study through translation into research question/s

Note: One has to be very careful with the terms or definitions used. For instance, the entity 'Mumbai' is used very loosely in the writing. The correct term should be "Greater Mumbai" covering the Districts of the city and suburbs of Mumbai. The coverage and scope of the work is tightly related with such definitions.

5.7 Framing the Research Questions

To be researchable, a research problem is to be translated into one or more research questions. A research question is a logical statement that progresses from *what is known and factual* to that, *which is unknown* and needs *validation*. Ideally the scheme is to frame a central question and then its associated sub-questions. That facilitates the investigation because formulation of a sub-question normally points towards data collection and analysis strategy in practice. The following example would clarify this scheme:

Central Question:

CQ - How can the quality of Indian research be raised?

Associated Sub-Questions:

SQ-1: Which are the governing factors?

SQ-2: Why the education system is not producing the quality research in India?
SQ-3: What is to be changed in the education system? What could be the incentives?
SQ-4: How the incentive scheme could be implemented in real life?

Framing of the sub-questions in this manner facilitate identification of the procedure to be followed to determine the answer. For example, "Which" type of questions try to identify the factors or parameters defining the issue, "Why" type of questions ask for the causes or reasons for the observed features that is, seeking to understand the relations between processes or actions. "What" type of questions require a descriptive answer that is, describing the features of a given phenomenon, "How" types of questions are concerned with bringing about change that is, exploring possible interventions and suggesting the most feasible solution.

5.8 Features of Research Questions

Research questions should be *well grounded*. Well-grounded means they are searchable questions. Such questions are not too narrow, too broad or too challenging. The following problematic formulations illustrate the point:

Too Narrow:

- Does India have a social security system?
- When was the "Emergency" declared in India?

These questions can be replied in one word.

Too Broad:

- What is the history and value of Philosophy?

This question cannot be covered in the scope of single work.

Too Challenging:

- Why is the Indian college education so lopsided?

This question is too opinionated and is based upon people's feeling across the colleges in a large country like India. It would need a very large-scale effort that is beyond a single individual working for the doctoral degree.

5.9 Types of Questions

5.9.1 Broad Types

- Testable questions – should help building theories and experiments and carrying out analysis
- Closed questions – those having a specific answer that may or may not be known e.g. what is the trend regarding the inflation rate in the last 12 months?
- Open questions – may have multiple answers and require empirical research e.g. what would be the composition of Party-wise Members in the given State Assembly after the next election?

5.9.2 Specific Types

- Existence e.g. Do senior citizens suffer memory loss?
- Description and Classification e.g. what are the characteristics of span of attention? Is it constant?

- Composition e.g. what factors define the leadership?
- Relationship e.g. is saving directly related to income?
- Descriptive-Comparative e.g. are instruction booklets with text and graphics more effective than those with text alone?
- Causality e.g. does multi-tasking degrade performance?
- Causality-Comparative e.g. is swimming better than cycling to build the physical stamina?

5.9.3 Good Questions

The questions having the following characteristics are considered as good questions:

- ✓ Clear
- ✓ Specific
- ✓ Answerable
- ✓ Interconnected
- ✓ Substantially relevant

Note: Sub-questions could be converted in hypotheses, if justified.

5.10 Examples of Central and Sub-Questions Formulation

5.10.1 Mid-Day Meal Scheme

Let the broad area of study be selected be,

“A Study of Mid-Day Meal Scheme in the Municipal Schools in Jalgaon during 2008-12”.

In order to carry out research on this topic it can be transformed into a researchable central question as stated below.

Research Question: What are the health and academic benefits of mid-day meal scheme in primary, and middle school sections of the Municipal Schools in Jalgaon during the time period 2008-12?

Treating this as a central question a few sub-questions can be formulated as follows:

SQ-1: What are the standards for health and academic performance adopted by the concerned public authorities in Jalgaon?

SQ-2: Is there a difference made by the mid-day meal scheme in the health and academic performance of elementary and middle school sections of the Municipal schools in Jalgaon?

SQ-3: Does mid-day meal supply a certain amount of nutrition value?

SQ-4: How does mid-day meal scheme operate and in what way can it be strengthened and expanded?

It is easily seen that very form of each sub-question is prompting the strategy for data collection and analysis. For instance, to address the question SQ-1 the policy documents of Education and Health Department of the Local and State Government are to be analysed. For the question SQ-3 the examination of records pertaining items of the meals served and discussions with the nutrition is expected.

5.10.2 Urban Housing Shortage Phenomenon

Let the broad area of study be the commonly discussed problem namely,

"Housing shortage is a chronic problem in urban India".

To conduct meaningful research on this problem it could be transformed into a researchable central question as stated below.

Research Question: What are the nature, causes and consequences of housing shortage in a given Indian urban area?

Corresponding sub-questions could be formulated, for example, as follows. Natural leads emerging for conducting the research to address them are presented below each question (in italics).

SQ-1: What is the extent of housing shortage?
This implies collection of data on population, family size and housing stock, for example.

SQ-2: What are the consequences of housing shortage?
This means study the aspects of slum proliferation and rents, for example.

SQ-3: Why does the shortage exit or what is the root cause of the shortage?
Data on say availability of developable land and construction costs are to be collected for analysis is the implication.

SQ-4: How can the shortage be removed?
Study of possible house-building schemes, policy of

> *increasing the floor space index (FSI) and other such measures is thus directed.*

It may be recalled that the necessary feature of a good research question is the absence of any unambiguous term (*Refer Section 5.9.3*). In that respect the formulation of the central question of the problem as given above is deficient because the concept of 'housing' and 'urban' are not unique and they are defined in a number of ways in the literature. It is therefore absolutely necessary to state which definitions are precisely adopted by the researcher for the study.

5.10.3 Evaluation of a Grievances Redressing System

Let the broad research topic be,

"Evaluation of the Employee Grievances Redressing System (EGRS) in an industrial unit".

Corresponding research objectives could be:

1. To determine EGRS awareness in the unit.
2. To measure managers' satisfaction with the EGRS working.
3. To identify perceived benefits and disadvantages of the system.
4. To measure workers' preference and satisfaction with the system.
5. To determine the role of Human Rresource Department in implementing the EGRS.

Corresponding research sub-questions could be:

SQ-1: Are managers aware of the EGRS?
SQ-2: Are workers aware of the EGRS?
SQ-3: How serious are they about it?
SQ-4: How much would this cost and give benefit to the workers?
SQ-5: What type of training should be organised by the Human Resource Department for the managers?

The substantive hypotheses could be:

H-1: EGRS will be popular among those who are inadequately paid.
H-2: EGRS will be considered as burden by the managers.
H-3: Human Resource Department will view EGRS as reducing its workload.

It is to be noted that the number of hypotheses is only three and not five to correspond each sub-question. The hypothesis should emerge naturally.

[Refer Sr. No. 1, 2, 36 and 37 under the Bibliography for more details]

5.11 Checklist

In sum it is useful to apply a checklist in the form of the following questions to the selected research problem before commencing the work:

C-1: Is the problem of interest for both current and future?
C-2: Is the research question put in clear, concise and

argument form?

C-3: Will its study contribute significantly to either theory or practice?

C-4: Will it lead to new research?

C-5: Will it be practical to conduct the research?

C-6: Can the research be completed within a reasonable time say, three years?

C-7: Is it possible to obtain reliable data?

C-8: Is one qualified or trained to handle the problem?

C-9: Will there be serious ethical issues involved in the conduct and presentation of the research?

For any selected research problem the answers to most of the questions from C-1 to C-8 from this list should be affirmative, whereas, the answer to the question C-9 should be negative to commence the research is the advice.

5.12 Researcher's SWOT Analysis

It is recommended that whenever a research is to be undertaken the researcher should perform the SWOT - Strengths, Weaknesses, Opportunities and Threats - analysis with respect to the chosen research topic. It means the researcher should carefully weigh his or her strengths and weaknesses to take up the said work. Further the possible opportunities to do novel work and threats that can act as barriers must be examined critically. Necessary actions are to be initiated to overcome the weaknesses and barriers on one hand and to reap the maximum benefits of the strengths and opportunities on the other.

The following framework illustrates the elements of SWOT analysis that can be reflected upon by a researcher for the selected problem:

Strengths:

- adequate qualifications and training
- field experience
- some publications in that area

Weaknesses:

- inadequate software facilities
- not adequate command on the requisite analytical tools
- absence of a team or group support

Opportunities:

- novelty of the problem to help breaking the new grounds
- possible application of new tools
- initiating a multi-disciplinary work

Threats:

- strong international competition
- time limit to complete the work
- internal hostility to the selected research area

In sum it can be said that the key to succeed in research lies in the articulation of the research problem and sub-dividing it suitably to steer the research process. Such a *divide and solve* strategy does produce gainful dividends is our experience.

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Chapter 6

Research Defining Elements

6.1 Concept

A generally accepted collection of meanings associated with certain object, event and behaviour represents a concept in the research. For example, an eligible voter in India is identified with the concept of a ‘major’ person (age equal or more than 18 years, irrespective of gender), and having a name in the official list of voters.

Concepts often are of a higher level of abstraction and difficult to define or observe like alienation and loyalty. For the operational purpose the concepts are therefore expressed by certain terms called variables that are defined below.

A meaning is rendered to the concept by defining them suitably in the given context. For instance, the distance between two locations could mean the shortest distance between them or the road or rail distance between them that may not be the shortest. In practice definition of a concept is accorded in either of the following two ways:

- *Dictionary definition:* a concept is defined by synonym [e.g. customer is a patron; a patron in turn is defined as customer or client of say, a bank]

- *Operational definition:* a concept is expressed in terms of specific criteria for testing and measurement [e.g. a ‘good worker' means say, whose production of defective items on average is less than five out of 100 items produced per day by him in a given industrial unit]

6.2 Construct

Construct is an image or abstract idea invented for specific research purpose and is composed of concepts. In the conduct of research a construct in the form of say questionnaire tool plays a very important role. For instance, presentation quality of a document is constructed by examining the concepts of:

- accuracy,
- word choice,
- font type & size, and
- sentence construction style employed.

6.3 Variable

A variable is a construct or the property being studied that can be assigned values. These values could be like categorical or nominal values of 0 and 1 for male and female, respectively or low, middle and high income groups according to income ranges and scale values from 0 to 5 to reflect increasing satisfaction level for a product by user.

The variables abound in variety as described below.

- Dichotomous Variable – takes only two values.
- Multichotomous Variable – takes more than two values.
- Continuous Variable – can take any value within an upper and lower limit (even fractional value).
- Discrete Variable – restricted to a set of whole number

of values or integers (even negative).

- Independent Variable (IV) – It probably causes, influences or affects outcome; it is to be manipulated. Also known as treatment, antecedent or predictor variable. More than one independent variable can specify the phenomenon.
- Dependent Variable (DV) – to be observed for effect caused by independent variable/s. Also known as criterion, outcome and effect variable. Usually, one dependent variable is examined, but more could be used in some complex description of a case or phenomenon.
- Moderating Variable (MV) – an additional (IV) that can have significant contribution to the originally conceived IV-DV relationship. Sometimes it is constructed by multiplying two IV variables to determine the joint impact of both.
- Extraneous Variable (EV) – external variable that may have to be controlled in some cases.
- Intervening Variable (IVV) – it is a mechanism through which IV and MV may affect the DV.
- Control Variable – facilitates comparison of two variables due to its presence (control variables like education, social class, income and occupation would be required to address a question: Does gender influence voting behaviour? A tool like analysis of covariance is used to control for these variables in practice).
- Confounding Variable – it is not actually measured or observed in a study. It exists, but cannot be directly detected. Influence of such variables is discussed while interpreting the results.

Example: A firm's promotion campaign (IV) will increase the tonic sale (DV), especially when free gifts are offered (MV), mainly among children (EV- control) because of enhanced attraction (IVV).

6.4 Proposition

A statement about observable phenomenon that may be judged as true or false is called as proposition. For example, Rajdhani Expresses reaches Mumbai Central mostly on time. This statement can be verified by examining the entries in the suitable record book of the Western Railway for say the last one year.

6.5 Hypothesis

A Hypothesis is an empirically testable proposition that is tentative and conjectural in nature. For instance, persons with M.A. degree in Political Science have better chance of selection in the Indian Foreign Service.

In the research a hypothesis plays a very critical role and that is why detailed treatment about is given in the Section 6.9.

6.6 Model

A Model is a representation of a system to facilitate its study in descriptive, predictive or normative manner. For example, a graphic model that shows the demand for product in different geographic regions of a country. It could be in the form of a mathematical equation expressing the sales growth.

For example, in the political science the following PAPA Model is often recommended to develop proper perspective about the research topic:

- Pure study: develop theory and principles to understand a phenomenon
- Application: use the knowledge gained to understand similar phenomenon
- Policy: prepare a policy framework to guide designing suitable schemes and programmes
- Action: implement the schemes and evaluate the performance to suggest revision

6.7 Theory

A theory is a set of interrelated concepts, definitions and propositions that are advanced to explain and predict phenomenon. For instance, technology life cycle theory, demand and supply theory and the theory of relativity.

Basically theory is an idea as to how a group of facts are related to each other. It helps in unifying an area of inquiry by a single scheme of interpretations for a whole group of apparently disconnected facts. Theories are open to revision or modification in the light of the changed circumstances or new evidence. Research is expected to increase the scale of credibility of a theory from *suggestive* to *persuasive* to *compelling* to *obligatory* status finally.

Propositional theories and *Dialectical* theories are the two kinds of theories that are with us for more than twenty five centuries. Propositional theory has the origin in the ideas of Aristotle that correct propositions about the way things are to be made by getting rid of any contradiction. This theory thus tends to be definitive and prescriptive. This design promotes 'pure' theories reflecting the discipline of mind of correct thinking. Dialectical theory is flexible and open because it assumes that contradictory elements pervade all the things. It thereby represents Plato's suggestion of multiple ways of thinking based on real-life experience. It responds to a question by another question to refine the answer.

Of late, the idea of contradictory life as a form of theory is proposed. They are called as *Living* theories. Practice is its one popular form. One makes a sense of what and why one is doing through researching it and the knowledge claims are tested for validity by the critical feedback of others. These theories are often expressed through new electronic technology to communicate living experience more effectively than words-only propositional form (Refer Sr. No.53 under the Bibliography for more details).

Characteristics of a Theory:-

§ *Structure:* it has some level of interrelation among a set of statements.
§ *Explanation:* it explains how or why things are true, not just what is true.
§ *Abstraction:* it offers more general or abstract accounts than a single observation.
§ *Verity:* it works on the principle of induction to explain or predict future observations.
§ *Descriptive:* given a cause and its effect, it tells why thing happened; it can however be twisted.
§ *Predictive:* given a cause, it tells what effects will follow.

- § *Synthetic:* given a desired effect, it tells what to do to cause it; useful in design and engineering.

Quantitative (time, error rate), Qualitative (happiness), Precision (deterministic or probabilistic), Aggregate or Individual and Universal or limited in scope, are the other operational categories of theories.

6.8 Law

A law is the proposition that has been sufficiently verified and accepted widely. It may be expressed by say a mathematical formula. Newton's Law of Gravitation in physics or Law of Large Numbers in probability and statistics are examples.

Note: Despite monumental studies Einstein's Theory of Relativity or Darwin's Theory of Evolution are not yet called as law. Sometimes it may be a matter of convention.

In general there are two logically different types of laws:-

1) *Fundamental:* prescriptive laws like theoretical and conservation laws and symmetry principles. The laws of library science enunciated by S.R. Ranganathan belong to this type (S. R. Ranganathan, *The Five Laws of Library Science*, E. Goldston Ltd., London, 1931).

2) *Empirical:* descriptive laws like phenomenological, functional, causal and structural laws. Moore's law about doubling the processing power of a microprocessor every 18 months belong to this type (G. E. Moore, "Cramming More Components onto Integrated Circuits",

Electronics, 19 April 1965, pp.114-117.).

Remark: Connections between ideas, social experience and social reality determine research paradigm. Research *paradigm* differs mainly on ontology that is assumptions about the nature of reality and epistemology that is assumptions about the way in which knowledge can be obtained. Here ideas mean concepts, theories, knowledge and other interpretations, social experience means individual conduct, social relationships, cultural practices and social reality means material and socially constructed world governing people's life. In other words research paradigm stands for the entire constellation of beliefs, values, techniques, and so on, shared by members of a given community.

Over the time some contrary instances or observations to the prevailing scientific theories do arise. Failure to account some of those observed results accumulates, leading to anomalies. Some anomalies are due to observational errors, some could be explained by minor adjustments to the existing theory, and normally scientists will not like to throw away the current theories so easily. Revolutionary science takes anomalies as crises and starts exploring alternative theories and questioning the old beliefs and assumptions. When all attempts fail to resolve those anomalies new paradigm arises (Refer T. S. Kuhn, *The Structure of Scientific Revolutions*, Chicago: University of Chicago Press, 1970, 2nd edition, with postscript).

6.9 Features and Role of Hypothesis in the Research

6.9.1 Research Hypothesis features

a. A statement about the generally held view called 'thesis'.

b. It reflects some tentativeness worth verifying.
c. It needs to be tested by various means.
d. It can help generalisation in some instances.
e. Its construction is closely related to the objective and the operational part of the research study.
f. It is conceptually clear and stated in terms that can be measured.
g. It has to have some empirical reference that means it is not based on moral judgment.
h. It must be specific so that all operations and predictions must be spelled out.
i. It should be related to the available knowledge and techniques.
j. It should be expressed economically using correct terminology.
k. It should be related to a body of theory that means there should be some rationale for its formulation.
l. It is better not written in a question form.
m. It is confined to one issue alone (uni-dimensional).
n. It is either in a non-directional form (e.g. training *makes a* difference) or directional form (training *makes a positive* difference in production output)

6.9.2 Sources

It may be noted that a hypothesis can arise from any source. For example it could be developed on the basis of some personal experience, past records, observations and discussions with experts and others, cultural values, intuition and folk wisdom.

Even a dream can be a source for hypothesis formulation as has been reported in several fields. The challenge is however to articulate it and pursue it to its logical end through rigorous research process.

6.9.3 Role of Hypothesis

A hypothesis formulation is considered useful in research because it can play quite useful role in conducting the research in variety of ways. For example a hypothesis

1. Provides the direction to the study.
2. Identifies relevant facts for the study.
3. Limits the inquiry to the interaction of certain variables.
4. Guides research design process.
5. Facilitates interpretations of the results.
6. Indicates the extent of knowledge gained.

Let us consider the following example to understand the above roles of a hypothesis:

Illustrative Hypothesis: Research output is low when researchers, guides and professional librarian differ in their perceptions about the developing the library collection.

This hypothesis immediately guides the study by raising appropriate questions and also suggesting a way forward. For example,

Who shall be studied? : Researchers, Guides and the Librarian

What context? : Library collection (print, non-print and digital)
What shall be studied? : Perceptions of these three stakeholders
How shall be studied? : Using the tools of questionnaire and interview

Note: Hypothesis formulation is not mandatory for every kind of research, however. It should emerge naturally in the course of study as far as possible.

6.9.4 Types of Hypothesis

A hypothesis can be of different types. Given below are a few types depending on the goal of the study:

General hypothesis: Here testing expectation, association and difference is the goal. For example, smoking is the root cause of several types of cancer.

Specific hypothesis: Here testing for a particular trend or trait is the goal. For instance jaundice, currently prevailing in this town, is due to contaminated water supply.

Other types are classified on the basis of their formulation:

Descriptive hypothesis: It states the existence, size, form or distribution of some variable, For example, the Indian college libraries are facing foreign journal subscription problem.

Relational hypothesis: It describes a relationship between two variables with respect to some case. There are two classes of it namely,

i) If it represents cause and effect relationship then it is called *Explanatory* or *Causal* hypothesis. For example research work (IV) causes use of e-resources (DV).

ii) If only association is implied then it is called *Correlational* hypothesis. For example, falling rates of library users and falling rates of original thinking are caused by the increase use of the Internet; here falling rates of library use and original thinking are related but neither causes the other.

6.9.5 Feature of a Good Hypothesis

1) A good hypothesis is a logical conclusion of a logical argument.

Example-1:

Premise 1: Academic success is highly valued and respected in society.
Premise 2: Being valued and respected by others contribute to high self-esteem.
Hypothesis: Higher level of academic success will be related to higher levels of self-esteem.

2) A good hypothesis is well amenable to testing of variables.

Example-2:

Hypothesis: People tend to forget their e-mail account passwords, if not used for one month.

A hypothesis of the form ‘what might happen if the heat from the Sun increases gradually in next 25 years’ should be avoided as it cannot be tested today.

3) A good hypothesis should be clearly refutable or falsifiable by results of the processed data.

Example-3:

Hypothesis: Overweight males are more prone to the heart attack.

A hypothesis of the form ‘the more sins a person commits, the less likely he/she is to get to heaven’ should be avoided because clear verdict on it cannot be obtained.

4) A good hypothesis should be positive about the phenomenon under study like relationship or difference.

Example-4:

Hypothesis: The new therapy technique does have an effect on depression.

A hypothesis of the form ‘there is no relationship between age and memory ability’ should be avoided.

6.9.6 Hypothesis Testing

It is important to note that a well-argued rationale justifying the formulation of the hypothesis must be put forth before launching into the testing of the hypothesis. In that context literature review and pilot study results help significantly.

A formal set up for testing a non-directional hypothesis (1) and directional hypothesis (2) is given below.

1) Non-directional Hypothesis (Association testing)

Null Hypothesis (H_0) : Training has **no impact** on the productivity of the workers in this industrial unit

Alternative Hypothesis (H_A) : Training has **an impact** on the productivity of the workers i this industrial unit

2) Directional Hypothesis (Validating the change)

Null Hypothesis (H_0) : Training has **no impact** on the productivity of the workers in this industrial unit

Alternative Hypothesis (H_A) : Training has **a positive impact** on the productivity of the workers In this industrial unit

or

Training has **a negative impact** on the productivity of the workers In this industrial unit

To statistically test the above hypothesis the collected data are to be analysed to figure out the daily average production (or proportion of defective items) and its variance per worker before and after the training. In the non-directional form of the hypothesis the objective is only to test the assertion whether new training makes a difference or not, whereas, in the directional form whether the difference in productivity is positive or negative is to be validated. The sample of workers is to be selected randomly to eliminate the bias (Refer Chapter 10 for various sampling methods).

Next step in this procedure is to derive a value of what is called as ‘z’ statistic (if the sample size is more than 30) or ‘t’ statistic (if the sample size is less than 30 or population variance is not known) by suitable mathematical formula. Value of this statistic is to be compared with the corresponding table value according to the non-directional or directional form of the hypothesis at the pre-fixed level of statistical significance or confidence level like 95% or 99%. It is denoted by the term dented by alpha - ‘α’. Typical values of α used in the research are 0.1, 0.05 and 0.01 corresponding to 90%, 95% and 99% confidence level, respectively. If the computed value exceeds the table value corresponding to α, the null hypothesis is to be rejected or otherwise. This statistical procedure gives a decisive verdict within the given data framework.

6.9.7 Errors in Hypothesis Testing

Two types of errors can occur in the testing the hypothesis as described above. They are:

Type I Error: It means the null hypothesis is true and it is rejected. Proper choice of the statistical level of significance and increasing the sample size are suggested to lower the likelihood of this error.

Type II Error: It means null hypothesis is false and it is accepted. Its likelihood can be lowered by increasing the sample size.

Note 1: Type I error is considered as more serious error.

When we reject or do not reject the null hypothesis, how confident are we that our decision is correct? This question is answered by the specified level of significance α. For example, if $\alpha = 0.1$ for a test, and the null hypothesis is rejected, then one will be 90% confident that this is the correct decision.

Note 2: It is recommended to avoid the term ‘significantly’ in the statement forming body of the hypothesis as far as possible. It can be confused with the level of statistical significance used for the hypothesis testing as described above.

6.10 A Standard Research Method

One of the popular research methods across the subjects and disciplines is known as the “Method of Falsification” enunciated by Karl Popper. It is a logic of explanation based on a critical method of trial and error in which theories are tested against reality. Its other names are: the method of hypothesis, the hypothetico-deductive method and the method of falsificationism.

The main plank of this logic is that to obtain evidence in favour of virtually any theory is possible and thus such *corroboration* should not lead to the acceptance of the theory. A theory is to be considered scientific only if it is refutable by a conceivable event. Every genuine test of a scientific theory, then, is logically an attempt to refute or to falsify it.

Popper's research strategy is illustrated in Figure 6.1. It is to be implemented in practice by the following steps:

1. Begin by putting a tentative conjecture, an idea, or a hypothesis to form a theory.
2. By specifying conditions under which the hypothesis is expected to hold, deduce a conclusion or a number of conclusions.
3. Compare the conclusion and argument with the existing theories to see if they advance our understanding. If so, go to the next step.
4. Test the conclusions by gathering data or performing experiments.
5. If the test fails, the proposed theory must be false and the original conjecture must be rejected (cautious ontology) and may be revised and tested in the same manner again.
6. If the test is passed, the theory is *temporarily* corroborated, not proven to be true.

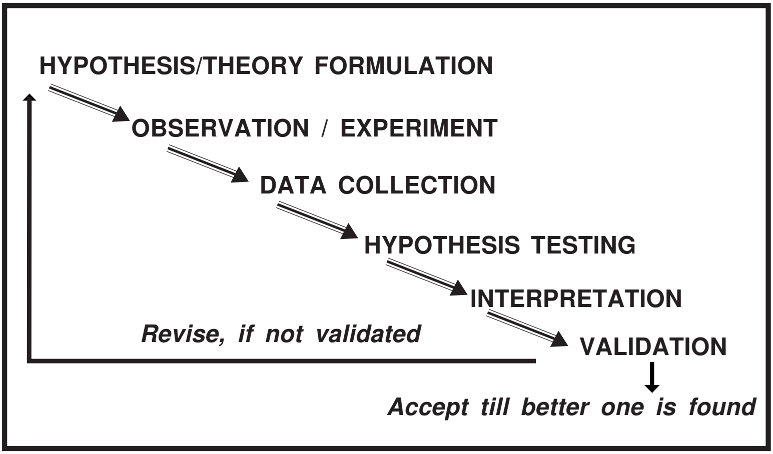

Figure 6.1 Logic of Testing a Hypothesis or Theory

It is clarified that the term ‘falsified’ used here does not refer to something being ‘fake’. Rather something can be (i.e. is *capable* of being) shown to be false by observation is the implication. The goal is to eliminate errors in theories by testing them rather than to credit theories with the claims of certainty.

If non-refuted theory meets the research objectives in a particular context, satisfies the stakeholders and produces useful outcomes then it can be accepted till a better theory is proposed. This is how falsification is seen to conform to the practical wisdom.

* * *

Chapter 7

Literature Search

7.1 Information Galore

Before commencing the research work on any topic it is worthwhile to search for the available documents that may have reported the study regarding its different aspects by the researchers or thinkers of the past or present. Certain topics may be of recent origin, but some topics will have a long history so the literature regarding them would be of antiquity. For instance, the topic concerning ethics in philosophy or evolution of warfare strategies under defence or military studies would require reviewing the literature from a very distant past. It is very rare that no reference is available on a given topic. Obviously documents of research importance could be scattered over different libraries, archives, individual collections to state a few sources. They would be in numerous forms like hand-written notes or manuscripts, print sources like journals and books, microfilms and electronic or digital files. Of late, with the all-round explosion of information in both print and digital forms the volume of literature to be searched is increasing rapidly in every subject.

Locating the documents relevant to the chosen topic is therefore a crucial step in the research. The research library has been the traditional place to stock such material. However, with the advent of the Internet in mid 1990s on a significant scale a new dimension for literature search has emerged. In that context evaluating the authenticity and reliability of the documents for the research purpose is another task. Obtaining such documents in full for review is the next action. Discussion of these issues is the aim of this Chapter.

7.2 Types of Information Sources

Information sources for the research are classified in three categories namely, primary, secondary and tertiary. Their characteristics and examples are given in this Section.

7.2.1 Primary Sources

- original material on which the research is based
- first appearance of data or results

Examples of such sources are raw data, photos, speeches, live event reports and videotapes of a performance. In respect of research the following are important primary information sources:

- Research Journals (importantly peer reviewed)
- Research Monographs and Books
- Conference Proceedings
- Doctoral Theses (approved ones)
- Research Reports and Notes
- E-Journals, Electronic Databases
- Satellite Imageries and Aerial Photographs
- Specific research discovery tools

7.2.2 Secondary Sources

- describe, interpret, analyse and evaluate the primary sources
- provide comments on evidence but their reporting is removed from the event

Examples of these information sources are compiled data, biographies, bibliographies, handbook, textbooks, patent index and newspaper articles. In respect of research the following are important secondary information sources:

- Abstracting Journals
- Documents providing Thesis or Dissertation Abstracts
- Government publications like Committee Reports, Acts, and Census Tables
- Trade and Professional Magazines
- Maps
- Electronic Databases

7.2.3 Tertiary Sources

- ➢ list primary and secondary resources
- ➢ compile and organise such sources and are far removed from the event

Examples of the tertiary information sources are encyclopaedias, almanacs, chronologies, and directories. In respect of research the following are important tertiary information sources:

- Yearbooks, Directories
- Subject Dictionaries
- Subject specific Encyclopaedias

7.3 Locating Information Sources

7.3.1 The Library

Even in the Internet age the library remains a major source for all types of material for research. It is more so for the comparatively old records. A Research Library in particular houses a wide range of sources of information to support research activities of the parent institution. Typically in the Indian academic research context the university or college library is expected to have some of the following items in its stock either in the print or digital form:

- Manuscripts
- Ulrich's Periodicals Directory
- Directory of Indian Periodicals
- Union Catalogue of Indian Periodicals
- Abstracting Journals
- Dissertation Abstracts
- Theses or Dissertations
- Research Journals
- Monographs, Conference Proceedings
- Advanced Text and Research Books
- On-line Databases and e-Journals
- Statistical Data (CD/DVDs)
- Subject Bibliographies
- Charts, Maps, Satellite Imageries and Photographs
- Microfilms
- Audio-video Tapes
- Directories, Dictionaries and Encyclopaedias
- Acts, Handbooks, Standards and Manuals
- Grey Literature like Pamphlets and Newsletters
- Newspaper Clippings/Files
- List of Relevant Websites

Getting familiarised with the library collection and its location is very important. Understanding the use of search tools like catalogue system, Web OPAC (Open Public Access Catalogue) system, and Listing of CD/DVDs helps in the independent search and exploration by the researcher.

Books in the library are shelved according to the order of say classification numbers or marks or notations. For this purpose quite a few standard classification scheme are available. A library generally adopts one of those. *Dewey Decimal Classification System* is one of the commonly used systems in the libraries according to which broad subjects are given a three digit number and the specific sub-subject or topic is suitably numbered and appended after a decimal point. Further, a book mark is created by putting first three letters of the surname of the first and second author or the title after the classification number separated by a stroke. Books classified by any other classification system would have similar arrangement. That helps proper shelving and accessing the books. Books having the same classification number are thus placed adjoining each other on the shelves. This offers advantage to the reader who while searching for a particular book comes to know about more titles on the subject. A researcher should thus make it a point to visit the stacks to get informed on a wider basis.

Often a collection of specific interest, though classified according to adopted classification scheme, is kept separately for easy search like the Census Reports or United Nations documents. Such a system of placement of library documents is called “Broken Order”. One can go directly to such specific collection, if interested.

Generally three book cards are prepared manually or now by using computerised library management software for a given book: one each for the author, title and subject. These cards are kept in separate catalogue card cabinets in alphabetical order. These catalogue cards carry basic information about the books. That helps one to search for a specific author or title or explore by the broad subject. Book mark with the classification number facilitates searching the physical location of the book. In many libraries all these details are available on the website of the library or its parent institution. So, one can search the catalogue information from any location even before visiting the library.

Current periodicals are displayed according to the subject or alphabetically. Old volumes of the journals, important magazines and select newspapers are usually stored in the bound form and shelved either alphabetically or in a classified order like books. Author and Title Index of the volume that is supplied by the publisher is also bound together to facilitate manual search. A *Cardex* system is normally used to maintain the records of currently subscribed and older periodicals in the library. It provides the imprint details and status of journals like available volumes, sent for binding and missing issues. Journals are generally not allowed to be taken out of the library, and are to be consulted within the library premises. Material of interest from journals is allowed to be photocopied by using in-house facility subject to copyright laws. For fragile documents photocopying is often not permitted. In that case the desired material is to be copied manually. Union catalogue of journals can inform the researcher about the availability of journals in other libraries in India.

Some special libraries like that of All India Radio, do maintain a stock of audio recordings in the form of old long playing records or audio tapes. Video and audio-video tapes are also preserved in many libraries. Conversion of some of those records in digital form is undertaken by a few libraries. All this material is vital for research in many areas. The researcher should get familiarised with the stocking arrangement adopted by the library for such material.

Quite a few research libraries stock microfilms of Ph.D. thesis, rare books, manuscripts or newspaper clippings. Before the advent of digital technology microfilm was a popular mode of storing the information compactly. Separate catalogues are maintained for them. Special reader-printer devices are necessary to view and print the information recorded on microfilms.

Keeping with time the research libraries subscribe to several standard electronic databases that mainly cover the journals in large numbers in electronic form. Some of the databases provide a journal right from its first issue, which is a great asset for the newly established libraries in particular. Most of these are online databases. Access to them may be on the library premise alone or campus wide or global. That depends on the negotiated licence agreement with the service provider or aggregator by the library. Each access scheme is charged differently and provides corresponding privileges and rights to the library and its users.

In addition the offline data in form of CD (compact disk) or DVD (digital versatile disk) are maintained by libraries. Getting oriented with these new forms of digital literature with the help of professional library staff is recommended.

For some research topics use of documents that form what is called as ‘grey literature’ is critical. These could be like leaflets, brochures or newsletters and cannot be classified in any standard form like book or periodical. They may just be kept in files or in box files without any bibliographical processing. For example, election manifestos of political parties form such document but they serve as a basic material for the research in many areas of political science. One must inform the library professionals about such sources so that material of this type is not considered as ephemeral and destroyed.

Photographs, maps, charts and satellite images are also maintained by some libraries which are of great use for researchers working for example in geography, geology and earth science in general. How that collection is organised by the library and what are the restrictions in its use must be understood by the researchers. Informing the library about the latest material available in the specialised areas and formats does prove mutually beneficial in the long run.

7.3.2 The Internet

The Internet is a massive network of networks that is, a networking infrastructure. It connects millions of computers globally, forming a network in which any computer can communicate with any other computer as long as both are connected to the Internet and use standard protocol system. It is expanding continuously in its geographic coverage and material variety. One of the major components of the Internet is web site that stores information in different forms like text, photograph, audio, movie and even X-ray outputs. Efficient file transfer service (ftp), e-mailing facility and instant messaging are a few other important constituents of the Internet.

With the proliferation of the Internet availability of information from various sources has increased immensely. Generally such information resides on the websites of individuals, academic institutions, publishers, and indexing intermediaries in the form of web pages. Millions of web sites are functioning on the Internet. Search engines are however available to guide the user to access the select web sites that may contain information relevant to him/her.

7.3.3 Web Site Organisation

It may be noted that web sites are of different types as given below. Their purpose is clear from the nomenclature employed. Some of them are free sites. Some sites provide limited information free, but charge for the additional information or service. Quite a few web sites are paid sites exclusively and no information is displayed without payment that is to be made using electronic fund transfer system prescribed by them.

- Archive site
- Commerce site
- Database site
- Directory site
- Search engine site
- Business site
- Community site
- Development site
- News site
- Web log site

Web site layout:

- ➢ **Home Page:** It gives a directory of contents and site map to inform viewer or browser how the information is organised on the website. Usually it provides a search window where the user can enter the term of interest and he is taken directly to the page containing it.

Contact details are provided for interaction. In many instances update details are given here to show when the web site was refreshed or revised. A counter showing number of hits that is how many visitors have browsed the web site is provided by some sites to show their popularity.

- **Content Pages:** these pages are organised according to the theme or topic or any other scheme considered useful by the website designer. Suitably links are provided among all the web pages.
- **Navigation Scheme:** since a web site can contain a large number of web pages a powerful internal navigation scheme is provided to help the user to address questions like: Where am I? Where have I been? Where can I move next? Moreover hyperlinks are also provided to external references due to which one can jump back and forth among websites very easily to obtain clarification or additional information without searching for it independently.

Location features of a web site:

- **Unique Address:** any website can be reached by keying in its address called URL (uniform resource locator) in the Internet browser. For instance, www.isg.org is for the website of the Indian Society of Geomatics. Here www stands for the worldwide web. For some sites "http://" to denote hypertext protocol is to be written in the beginning of the URL. For example, http://www.nonkilling.org for the website of the Center for Global Nonkilling. Moreover one can directly go to a particular web page if its specific URL is known like http://www.nonkilling.org/node/18 for a particular research paper on the above web site. Such detailed URL is provided and is expected to be provided along with other particulars in the Reference section in the research paper for precise access.

- **Bookmarking of URL:** once visited URL can be bookmarked for future use by employing corresponding utility available in the standard Internet browser software. This saves on remembering and keying in the full URL. The Internet browser can maintain a fairly long list or history of such URLs, which can be cleared or refreshed periodically.
- **URL as a Guide:** generally a web site URL indicates the type of associated institution by its extension in the end such as,
  - edu for education
  - gov for government
  - org for non-commercial organisation
  - ac.in for the Indian academic or higher education institution
  - com for commercial organisation

Exploring the Internet optimally is a challenge in itself. Searching a huge mass of information for the pertinent and reliable sources can easily consume hours together. Quite a few powerful search engines are available to aid the search process. In this context *Wikipedia* is one web site that provides some information and reference sources on almost any topic. It is continuously updated through collaborative efforts. However, information from this source may not necessarily be of research quality and, therefore, the researcher should probe further the leads it provides. Quoting Wikipedia as a source in a research document is usually not recommended.

In sum, the Internet is becoming the first referral point for any query in the contemporary era.

7.4 Source Evaluation

While searching and learning about information from various types of sources as described above, the researcher has to be cautious about the authenticity and reliability of the information provided. In research the reference to non-standard source for data and information is not considered valid. In case of the print media the publications by well-known publishing houses, journals published by academic bodies, learned societies and documents of government agencies are largely considered as standard. However, in the Internet world anyone can establish a web site, put up the information and modify or drop it without notifying or obligations. That is why one has to be extra careful while quoting the web reference and invariably the date of browsing or downloading must be mentioned along with it.

In this context one has to assess the purpose, scope and authority of the information provider. Preface or Introduction Chapter of a book or Abstract of a research paper provides most of these details. Name of publisher, place of publication and year of publication also help in judging the quality of the source and recentness. Similarly the Home page of a web site gives some basic information from which one can make an assessment in this regard. Newspaper or a popular magazine as a source generally do meet the above criteria and are to be avoided for citation as research reference source as far as possible. Exception is to be made for the research in some areas, like media studies, where quoting them may be necessary. In any case cross checking of information from more than one source is a useful research practice.

7.5 Search Strategies

Preparing a search plan is recommended whether for finding relevant books, journals, reports and other print material or electronic databases, web sites or the Internet in general. Starting with basic subject or broader term and then narrowing it down by articulating suitable keywords is found quite suitable for undertaking systematic search of literature. Naturally, there would be a difference in the search operations for print material in the library and digital one on web sites and the Internet. We present them separately.

7.5.1 Library Search

One can start with an advanced book or monograph covering the subject; reading its appropriate sections, checking the sources cited in the footnotes or endnotes or at the end of the book under the References or Bibliography or Additional Reading List provides further information about related sources. Similarly a perusal of the card catalogue or OPAC facility of the library can help identifying books and reports that broadly address the research topic. Framing more specific queries on the basis of the study of that material would lead to more specific references.

In research the journal is the most important source because the journal is normally published in separate issues and thereby reports the latest studies and results. One should first consult *Ulrich's Periodicals Directory* to list down the primary, secondary and other journals that may be reporting the results on the selected topic. Locating those journals for browsing and reading is one important action.

Identifying a few ‘key words’ or ‘descriptors’ (search terms) relevant to the topic or research questions should be the next step. Searching the “Abstracting Journals” by those key words can help identifying relevant research papers and journals in the field of interest. Examining those professional journals and other sources in greater depth can lead to more references and other material. In particular such search should cover the following sources both current and older ones:

- research journals (peer reviewed)
- professional magazines
- conference proceedings
- books (advanced ones), particularly the series on various aspects of quantitative and qualitative research by standard publishers
- government publications
- thesis or dissertation abstracts
- research monographs

Consulting the librarian or reference section of the library for additional information and sources like CDs/DVDs, microfilms, tapes and grey literature would provide a comprehensive picture of the pertinent information sources and the contents.

Maintaining record of all searches systematically on cards or in computer files proves immensely useful later for cross checking and research writing. Each card should record the author, title, other imprint details, a summary of the contents, special features, library name, classification details and the date when it was consulted. These cards could be arranged say author surname-wise alphabetically or by any other order to facilitate search. Repeat consultation of a reference is greatly facilitated by this bunch of cards anytime in future.

Copies of the selected material like book chapter, research paper or microfilm printout are to be obtained by photocopying and other available means. If found necessary, recourse to manual copying should be adopted, for example in the case of old manuscripts they are not allowed to be photocopied because the bright light used in the process can damage them.

7.4.2 Web Search

Same set of key words that were used to search print material in the library can be used to search the Internet and web sites.

Search tools:

- search engine for locating information about specific document, organisation or individual
- meta search engine for a fast overview about what is available on web for a specific query
- subject directory for area-wide coverage
- subject guide for narrow topic and more in-depth search

Most of these search engines provide free search service. It is useful to know the display scheme of the search engines for the retrieved information because some of them employ their own ranking system for presenting the sources for a given query. Some of them are governed by the commercial interests.

7.4.3 Boolean Search Strategy

Combining key words by connectors like “and”, “or” and “not” for search has the origin in the algebraic operations articulated by George Boole and that is why employing them is called as *Boolean* search in his honour. Application of this strategy is vital otherwise the search engines would locate millions of websites and pages to look at.

Simple Search:

- By entering simply dawkins evolution one would obtain all those documents where word dawkins or evolution has occurred (OR operation)
- By entering +dawkins +evolution or “dawkins and evolution” one would obtain all those documents where both the words dawkins and evolution have occurred (AND operation)
- By entering +dawkins +evolution –god one would get those documents that contain the words dawkins and evolution but not the word god (NOT operation)
- By entering +dawkins +‘creation theory’ one would get all the documents containing the word dawkins and the complete phrase creation theory (Narrow search)
- By entering dimension* one would get documents containing all those words whose beginning is dimension such as dimensions, dimensional, dimensioning and so on (Wild Card operation)

Advanced Search:

Combinations of various simple search operations stated above can help obtaining further specific documents alone.

All the web pages so downloaded can be examined on the computer monitor or saved on the hard disk to read them later. While reading them, further references could be noticed and they are to be tracked and obtained, if considered useful. Select pages could be printed for offline perusal.

Remark: Zotero software is one free software tool to manage literature search on the Internet for a selected research topic. It can further organise the downloaded references in any of the standard bibliography style like APA or Chicago Manual reference style (See Chapter 13 for more about these styles). This saves efforts while preparing the list of references or bibliography part of the thesis or dissertation,

Literature search is a continuous process because new publications would continue to appear all the time. Having obtained the relevant documents in a fairly good number the next step is to sort them in priority and mark them for reading in a sequence. A review of their content to get informed about the state of the knowledge pertaining to the given topic or theme should be commenced in that order. To that end we turn to the review of literature in the next Chapter.

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Chapter 8

Literature Review

8.1 Literature Review Stages

Literature review is not a ritual. It plays an important part in appraising the status of the knowledge in a particular topic or field. It helps in identifying the concepts and tools employed by other authors and conceiving possible directions for further study and advancement. It is therefore clear that the literature review needs to be done critically and with full seriousness. A review of the work should be presented objectively without compromising the professional integrity.

The activity of literature review starts by reading a few relevant documents on the topic of interest that are searched and collected. In fact, to large extent the activities of literature search and review go hand in hand. Literature review is required to be carried out in quite a few rounds, particularly for the doctoral research work. Revisiting periodically the review work done in the past proves useful is our experience. It can be reconsidered and revised, if necessary, in the light of the literature that comes to the view later.

In preliminary rounds the literature review is often carried out to decide the broad area of a research study. It could involve reviewing the material like research papers from a journal and general material like articles from a professional magazine. During this process triggering of new idea or getting insight about the problem could occur. That helps to narrow down to the precise topic for undertaking the research.

In the next stage of literature review a few specific research papers or other specifically marked documents are examined critically to help articulating the research problem. Aim of this review is to build sufficient justification for pursuing the study. It also assists in delineating the scope of the study. These inputs are of great significance in preparing a research plan. In practice such a plan is formalised in the shape of a research proposal. It could be submitted for approval by the concerned review committee of the university or research institution for carrying out the research accordingly. A research proposal could also be submitted to a funding agency. Experience shows that a concise and well written review of a few key research papers and other literature sources on the subjects lends a weight to the research proposal.

Literature review is however expected to continue throughout the study because a mass of new and old unearthed documents would keep coming to notice all along the research process. This activity may be stopped temporarily, when the final draft of the thesis or report is prepared and sent for binding. A critical review of literature forms an important part of the thesis as it provides the necessary setting to present the own work. Quite often it is included as one exclusive Chapter of a research thesis or report. Literature search and review is to be resumed and continued thereafter to remain up-to-date about the developments in the field. That becomes quite handy at the time of the thesis defence many a times.

It is to be noted that a section of literature review in respect of the subject matter is also an inherent part of a research paper.

Most of the journals periodically welcome a *review paper* evaluating the literature in the field to inform the status of the knowledge and chart out possible directions for further research. One can thus convert the literature review Chapter or portion of one's doctoral thesis in a review paper and explore its publication in a suitable journal. It is a practice by some journals to commission an expert in the field to write such a review paper say, every ten years to enlighten the readers about the advancement and state of the art. Receiving such an invitation is considered as an honour in the academics and reflects on the good standing of the researcher.

8.2 Literature Review Focus

To learn how other researchers have perceived the problem and addressed it and the related issues is one of the goals of the literature review. That facilitates understanding the problem in greater depth. The definitions adopted and tools used for measuring say key parameters become clear by this exercise.

Learning about various data sources that other researchers have used is another objective achieved. The list of references given by them helps in broadening the search and knowledge additionally. How the proposed research would be related to the previous works of other researchers emerges by such a study.

To identify new areas or gaps in the body of the existing knowledge related to the study topic is one more objective. It provides a clear direction to the research and well-grounded justification to undertake the study in a specific manner.

Literature review also focuses on the limitations or errors of the reported studies and facilitates developing a research plan to overcome those pitfalls. A new area for research could thus emerge is one more benefit.

8.3 Conducting a Literature Review

Barring some exceptional topics the research material in appreciable volume on the selected topics would be collected by the researcher normally. It is therefore necessary to employ a systematic procedure to conduct the literature review gainfully.

In this regard from amongst the collected research papers and material sorting out the sources most relevant to the topic should be the first step. Their reading with utmost concentration and critical viewpoint should get the top priority. Repeat readings of some of those should be done to get full meaning and significance. Next obtaining and reading the important references cited in these sources are to be pursued. That helps in assimilating the sizeable knowledge related to the topic under study. Use of Citation Index of the author and/or Impact Factor of the journal to know the quality of the research papers so collected can guide in deciding the order in which the material should to be examined.

8.3.1 Research Document Quality Analysis

One has to analyse every aspect of a research paper to make an assessment. Some features are studied to make the first level assessment or broad judgment about the overall quality of the work. Those are like,

- Year of publication to know the recentness.

- Publication outlet say, journal title or name of the publisher and place of publication to judge the likely standard of the contents.
- Name and affiliation of the author to know about his/her reputation and professional association.
- Funding agency, if available, to assess the importance attached to the work by an external agency.

Next the following facets about the contents are to be identified to prepare a review:

⇛ Research question and rationale
⇛ Theory and literature review
⇛ Hypothesis, if available
⇛ Methodology
⇛ Data collection strategy
⇛ Data presentation
⇛ Data analysis
⇛ Interpretation and discussion
⇛ Conclusion
⇛ Implications
⇛ Style
⇛ References and bibliography
⇛ Appendix

8.3.2 Issues to Examine

Answers to the following questions must be contemplated while reading the research material. A summary of those should form an overall review:

† Is the title of the paper or report appropriate?

- Does the writer clearly specify the main research questions (Why type of questions, say)?
- Has writer demonstrated the value of his/her contribution (to knowledge, for example)?
- Has writer articulated his/her proposed theory and hypotheses with adequate background material?
- Are the independent and dependent variables identified and defined precisely (if used)?
- Is the specified research design strategy adequate for controlling influence of other possible causative variables (extraneous factors)?
- What is the method employed for data collection?
- Is the sampling plan suitable, if used?
- Are the observations made consistent and reliable?
- Are the constructed statistics (like ‘t’ and ‘z’) appropriate for the type and level of measurement of the variables?
- Has the writer validated the results?
- Are the research findings presented clearly and discussed adequately?
- Is the Bibliography or Reference list satisfactory, recent and accurate?
- Have the references been prepared using a standard style? Are the references properly cited in the text?
- Are the Tables and Figures presented clearly and followed a standard style of presentation consistently?

8.4 A Core of the Review

A review should clearly state the issues studied by the writer, that is, the scope of the reported work. If a specific stance is taken by the writer then it should be commented upon and evaluation is to be done keeping in view that angle. For example, a perspective like Marxism or feminism is taken by the reported writer to study a given phenomenon or issue.

Methodology employed by the writer should be examined for adequacy for the stated purpose of the study and possible alternatives could be discussed, if judged useful. This is essential if one thinks that the methodology choice had a major bearing on the results. For instance, employing interview method to solicit the responses in a stated manner might have influenced the responses to a significant extent.

The contents in a Literature Review Chapter of the thesis can be organised in several ways. It can be presented according to authors or chronology or geographic regions or variables or even hypotheses. Consultation with the research supervisor and/or subject experts would prove useful in this context. Generally the choice is dictated by the subject nature of the study. The review matter should be divided in suitable paragraphs correspondingly for effective presentation.

It is important to conclude whether the reviewer agrees fully or partially, or totally disagrees with the conclusions of the writer. Reasons for the same are to be put forth with sound arguments. That is how a critical review is distinguished from the ordinary reporting. In a thesis the review of similar works could be commented upon together.

Concluding a Review Chapter by stating what pointers one can glean from the reviewed work for further research like testing alternative theory, replicating it in different setting and using new analytical tools is recommended.

8.5 General Benefits

Preparing a critical review of the literature serves the researcher in several ways as it:

- Helps designing study to answer an “old” question in a new manner.
- Sharpens the skill of making a concise summary of the lengthy matter.
- Leads to providing a general explanation encompassing previous interpretations.
- Guides in exploring and evaluating new variables or factors.
- Results in developing new terminology.
- Assists in selecting suitable outlet for publication of the study results.
- Furthers the conceptual, empirical and theoretical aims of the research project.
- Points to new styles of presentation and organisation of the material.

8.6 Cautions

One must be aware of certain perils while performing the literature review. For example, one may just confine oneself to a narrow focus ignoring conceptual resources that may be of equal importance to the study. On the other hand, one may devote more energy for covering the field rather than focusing on theories that are relevant to the study. A proper balance is necessary.

A tendency is often seen to describe simply what previous researchers have said, whereas, in a literature review the researcher's own assessment of those contributions is expected. Moreover the literature review for the research is to be done in an objective manner and should not get influenced by researcher's beliefs, fancy or ideology.

8.7 Review Tips

It is very important to note that for good and precise writing besides the practice, diverse reading is very helpful. For instance, the style followed by the monthly magazine *Reader's Digest* to condense the matter without diluting the message is worth adopting. One should, therefore,

- ✓ Read as many review papers as possible to gain the insight in the subject as well as presentation style.
- ✓ Read the published book reviews regularly and observe the new terms and styles employed.
- ✓ Prepare and send (e-mail) letters to the editors occasionally because that helps writing crisply in a limited number of words.
- ✓ Communicate professional views about book or article to its author or editor and evaluate the feedback received.
- ✓ Write and submit full book reviews or short book notes for publication in various periodicals regularly to sharpen the reviewing skill and articulation.

[Refer Sr. No. 14, 29 and 42 under the Bibliography]

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Chapter 9

Research Methods

9.1 Classes of Research Methods

There are two main classes of research methods namely, *quantitative* methods and *qualitative* methods. Research in science, dealing mostly with the study of nature and related phenomena, uses quantitative methods predominantly. These methods are also called as *positivist* methods. In contrast the research in social science usually dealing with human behaviour and actions employs qualitative methods. They are also called as *post-positivist* methods in literature. Encouraged by the success of science there has been growing emphasis in deploying quantitative methods for conducting social science research.

Quantitative methods are both deductive and inductive in nature; they strive for theory-testing and prefer use of statistical or analytical tools to perform data analysis objectively. They typically deal with the issue in the following manner: *Whether and to what extent variance in x causes variance in y?* (the term variance has a specific meaning in the field of Statistics)

Qualitative methods on the other hand are generally inductive in nature; they aim at theory-generating and prefer to interpret the non-numerical data for arriving at the results. It is natural that these methods differ a great deal in their approach and working in practice. They typically deal with the issue in the following manner: *How x plays a role in causing y? What the process is that connects x and y?*

Since both these classes of methods have their strong and weak points it is now recommended to use their combination that is known as *mixed* methods depending on the nature of the problem. Rest of the Chapter is devoted to the discussion of all these research methods and allied issues.

Note 1: Experiments are generally performed to obtain data for applying these methods. They could be carried out in the laboratory or field. Some experiments are finished quickly like in chemistry, whereas, some can take years like those in astronomy. Here a great care is to be exercised to block the influence of any external factor. Advance statistical procedures under the *Design of Experiments* are available for this purpose.

Note 2: Thought experiments dominate research in some fields like mathematics, philosophy, languages and literature. Abstract thinking is its central point. Of late, a computer software tool of *Simulation* is found quite helpful for such researches.

9.2 Quantitative Methods

9.2.1 Approach

- To remain neutral or value-free while performing the analysis and interpretation.
- To use statistical and analytical methods for analysis.
- To produce predictive theories based on experimentation and analysis.

9.2.2 Use of Statistics

Various concepts and methods of Statistics are used to perform analysis on the numeric data collected through surveys and other means. In fact use of statistics pervades through most of the research process steps as shown in Figure 9.1. Descriptive Statistics helps in presenting the background information and some of the results in very attractive manner. However Inference Statistics provides a wide variety of tools for analysis and drawing conclusions.

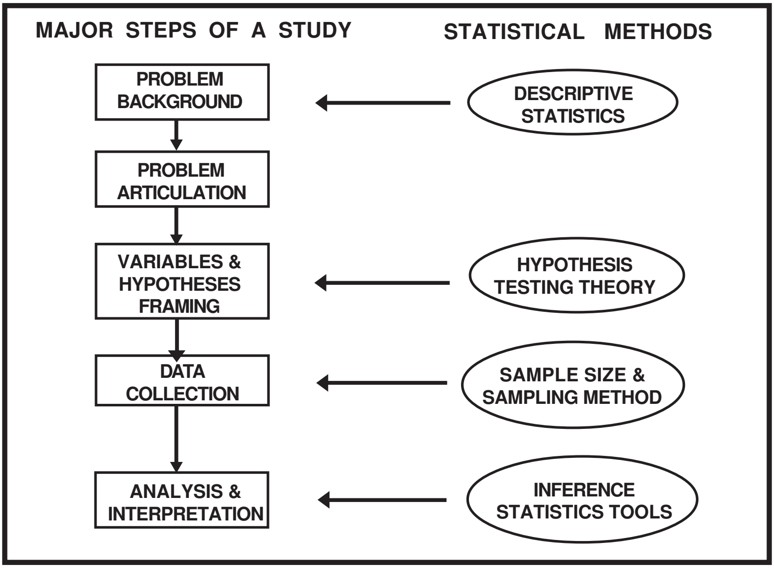
MAJOR STEPS OF A STUDY
STATISTICAL METHODS
PROBLEM BACKGROUND
PROBLEM ARTICULATION
VARIABLES & HYPOTHESES FRAMING
DATA COLLECTION
ANALYSIS & INTERPRETATION
DESCRIPTIVE STATISTICS
HYPOTHESIS TESTING THEORY
SAMPLE SIZE & SAMPLING METHOD
INFERENCE STATISTICS TOOLS

Figure 9.1 Statistics at Various Stages of Research

9.2.3 *Use of Inference Statistics*

Several statistical methods are available to perform the data analysis and help drawing the inference. Some of the major methods are described here in three categories as given below.

1) Hypothesis Testing - If the hypothesis is to be tested on the basis of two samples, the computation of 'z' or 't' statistic and their use described in Chapter 6 sufficient. However, if comparison of more than two samples is involved in the study, either *Chi Square* test or *F-ratio* test based on the *Analysis of Variance (ANOVA)* is to be used.

It may be noted that Chi Square test can also facilitate in curve fitting of data that is, to test whether the given observations can be represented by a standard statistical distribution like Poisson or Binomial distribution.

Further, all the above tests are based on the assumption that the phenomenon under study would follow a normal distribution if very large sample is processed. Technically they are called Parametric Significance tests. However, for many problems in practice where this assumption may not hold good a set of Nonparametric Significance tests are available. *Kolmogorov-Smirnov* test, *Wilcoxon Signed Rank* test, *Mann-Whitney* test and *Kruskal-Wallis* test are some of the prominent amongst them. Procedure for using them is similar namely, construct the test statistic by the prescribed formula, test its value against the corresponding table value at the assumed level of significance and reject the null hypothesis if the computed value exceeds the table value (exception is the Wilcoxon Signed Rank test where this rule is to be applied in reverse).

2) Measures of Association - As the name suggests the methods under this category describe the relation between variables considered in the study. Some of the prominent techniques are as follows.

a) *Bivariate Correlation Analysis:* It helps to study the direction and magnitude of association between two variables. For example, data series about stock prices and bullion prices can be examined about their possible relation using such analysis. A large number of measures in the form of correlation coefficients are available for this purpose like *Pearson correlation coefficient, Kendal's tau, Spearman's rho, Cramer's V* and *Kappa*. The nature of data guides the selection of appropriate measure.

b) *Linear Regression:* It is possible to test whether the changes in one variable called *dependent* variable can be significantly explained by the linear change in one or more variables called *independent* variables. Variations of such models are given below.

$Y = a + bX$ (basic simple bi-variable linear regression model)

$Y = a + b_1X_1 + b_2X_2 + \ldots + b_nX_n$ (multivariable linear regression model)

Where Y is the dependent variable, a is the constant, X_i's are independent variables and b_i's are regression coefficients (The error term in these equations is assumed to follow a Normal Distribution with mean 0 and standard deviation of 1).

Systematic procedures are available to test whether such linear relation exists and to estimate the values of a and b_i's. If the relationship is found stable it can be used to interpret the data in variety of ways. Advanced models are also available to test the existence of nonlinear relations. In the multiple linear regression equation the impact or contribution of each independent variable in explaining the phenomenon can be easily assessed and impact of dropping some and adding other variables can also be studied (*Stepwise Regression Analysis*).

Sometimes, value of an independent variable of some previous time period can provide a better fit for such equation. They are called *lagged* variables. For example, the bank branch deposit of current quarter may be expressed as a function of population, economic activity and advertising expenditure. In such a case the advertising expenditure of say previous quarter may give a better fit because its impact becomes operational now.

Logistic Regression Analysis is another variety quite useful for analysing qualitative data like response (dependent) variable taking on only two possible values namely, 0 and 1.

It is however necessary to remember that the relationships as described above are purely mathematical in nature and not necessarily the causal relations. The researcher has to build argument for that purpose. Again it is assumed that there is no or insignificant correlation between the independent variables. If this is not true then the problem of *co-linearity* of variables arises and the relationship is distorted. That is why use of more than three to five independent variables is not recommended in practice unless strong justification is available. Moreover, more the variables mean more effort in data collection is called for. The researcher must determine a suitable trade off.

c) *Time Series Analysis:* It is a particular case of the regression analysis discussed above. Here the independent variables are replaced by only one variable namely the time. This is found quite useful in financial modelling where it is difficult to isolate a large number of independent variables that may be affecting say the share prices. In such case time series analysis of share prices over a long time period can reveal a stable pattern as the time levels the economic and social factors in the long run. Statistical methods are available to eliminate the seasonal variations and cyclic variations among the given time series data and to establish a suitable mathematical equation, either linear or curvilinear, that can be used for prediction of the dependent variable in future with a fair degree of confidence. Many social science phenomena can be analysed using this method.

3) Multivariate Analysis – Besides multiple regression analysis discussed above, there are quite a few other techniques involving more than two variables that can facilitate the study of a complex social phenomenon. These techniques are classified as dependency and interdependency techniques. If the study context can help identifying the predictor variables then the dependency technique like multiple regression is to be used. On the other hand, if the variables are interrelated with no possibility of designating them as dependent and independent variables, the interdependency techniques are to be used. Some of the major techniques under both the categories are outlined here.

Dependency Techniques:

a) *Discriminant Analysis:* It is used to classify objects or entities into two or more groups based on several predictor indicators. For example, one needs to classify persons as either efficient or inefficient, risk takers or avoiders and so on. It leads to developing the discriminating equation like

$$D_i = d_0 + d_1X_1 + d_2X_2 + \dots + d_kX_k$$

Where D_i is the score on discriminant function i, d_i's are weighing coefficients, d_0 is a constant and X_i's are the values of the discriminating variables used in the analysis.

A single discriminant equation is needed for categorization in two groups, two equations for three groups and N-1 equations for N groups.

For example, it is required to place the students in two main groups of Clever and Ordinary based on their performance in three subjects English, Mathematics and Science. Processing the data about the marks scored by sample of say 30 students in these subjects under the discriminant analysis may show that marks in Science is not a significant contributor to the discriminant function. The function may be of the form,

D = -8.807 + 0.080(English marks) + 0.0978(Mathematics Marks)

This can be used in future classification of the students based on their marks in English and Mathematics.

b) *Conjoint Analysis:* This is useful to evaluate a set of attributes to choose the best one that would meet the needs. The objective of conjoint analysis is to generate utility score that represents importance of each aspect of a product or facility in subject's overall preference ratings. It produces a linear function where the variables are the attributes on the basis of the preference ranking indicated by the respondents. The combination giving the highest utility score emerges as the best design choice.

This method is useful in evaluating a scheme or a service having various features and consumers are of different types. Such issues are important in marketing, product design and policy formulation.

Multivariate analysis of variance (MANOVA) and *Structural Equation Modelling (SEM)* are two other important dependency techniques.

Interdependency Techniques:

a) *Factor Analysis:* It helps to reduce the number of variables and discover the underlying constructs that explain the variance in the original data set. It builds a correlation matrix to derive a factor matrix from which the best linear combination of variables may be extracted.

This is quite useful in reducing the dimension of the problem as it statistically indicates the most relevant factors affecting the phenomenon and only those may be processed further for building say a regression equation.

b) *Cluster Analysis:* It is a classification method that is employed to organize a set of cases or objects into clusters. The aim is to establish a set of clusters such that members within a cluster are more similar to each other than they are to members in other clusters. It involves building suitable metrics for measuring the similarity and dissimilarity among the clusters.

Application of this technique in sociology, psychology, marketing and planning is found quite useful.

Multidimensional Scaling (MDS) is another important interdependency technique. It is quite useful in psychological research particularly to understand difficult to measure constructs like quality and desirability that are perceived and cognitively mapped differently by different individuals.

Although these techniques involve intricate computations, thanks to the software packages, the researcher is required only to select the suitable method and supply the data in requisite form to obtain the results.

A large number of computer software packages both proprietary and open source variety is available to apply the above statistical methods for research. A researcher should learn one of these packages for the long term benefit.

9.3 Qualitative Methods

9.3.1 Approach

- To use non-statistical inquiry techniques and processes for gathering data about social phenomenon.
- To collect data in the forms of word, symbol, picture and other non-numerical records.
- To create understanding for subjective interpretation and critical analysis of the collected data.

9.3.2 Select Perspectives

Given below are some of the positions taken up by the researcher in undertaking the qualitative studies.

- **Anti-Foundationalist:** Accepted and known assumptions may not hold good. Concepts like democracy, honesty, ethical behaviour are to be constructed from time to time. Interpretations of these concepts are one of various possible meanings. Analysis in this framework explains for example why no consensus about public environment policy at the international level is reached; every society has its own perception about the environment problems and measures to deal with those.

- **Feminist:** Women see things differently than men; they have different ways of learning and describing meaning. Role of gender in analysing an event is to be given prominence. It is one form of action-oriented research advocating the social, political and economic equality of men and women.

- **Marxist:** Class conflict is at the root of the political behaviour. Economic forces determine social conditions, capitalist production methods determine the role of man, material holding of ruling class and economic and political structures establish the actions of man. Critical analysis of social and political institutions is always necessary.

- **Post-Modernist:** It opposes positivist approach. Its key principles are: no single social truth exists, there is no one absolute way to gain knowledge and no rule exists to guarantee the rationality of science.

9.3.3 Major Methods

A. **Case Study Methods:** Here focus is on a whole entity like organisation as a group for in-depth study, and not on variables. This is an *observational* study method where the subjects are not manipulated. The case description can serve as an example of similar groups. *Explanatory* type question is asked: what is distinct about this group?

Types of case studies:

- *Intrinsic* – it is done when researcher wants to provide a better understanding of the case itself.
- *Instrumental* – it is undertaken when researcher wants to get greater insight into a specific issue.
- *Collective* – multiple-case design where more than one cases are studied together for greater understanding of a phenomenon (also called as multisite qualitative research).

Steps:-

1. Case Framing – what should be studied and why?
2. Key Constructs – items firmed up.
3. Unit of Analysis Selection – individuals, groups or neighbourhood.
4. Data Collection – observation, detailed interview and examining documents.
5. Data Analysis – grouping as per key constructs, generating categories, themes and patterns, developing generalisatios, testing alternative interpretations, forming or refining possible theory from the case.
6. Case Report Writing – producing a comprehensive narrative of the key constructs, discussing alternative interpretations of the facts and ending with firm conclusion.

B. Hermeneutics: It originated with interpretation of biblical, legal and classical texts. Focus is on interpretation of texts, tools, art objects and actions of humans in social situations. Observe, describe and create theories is the ultimate aim. Interpreting the actions, beliefs and norms for comparing and generalising about social phenomenon is attempted. *Interpretive* question is asked: what meaning does this text hold?

Steps:-

1. Relating parts of the text to the whole, and then again back to the parts till entire text is interpreted (called *hermeneutic circle*) is the main procedure.
2. Laws for interpretation: a) belief and actions of social actors are to be interpreted without interference, b) interactions among all actors must be understood within their own context, c) researcher must have some common experience with the group members, and d) derived interpretation must conform to the intentions of the actors.

C. **Ethnography:** It means descriptive study of living cultures and involves actively observing, recording and explaining the phenomenon by participant observation. The activity of data gathering under the ethnography is call *ethnology*. This is to be contrasted with *ethology,* which means practice of unobtrusive observation such as for the study of animal behaviour (e.g. the work of Charles Darwin falls in this category).

Steps:-

1. Note down or record everything happening in the group - called ‘thick description’.

2. Ask self-interpretive questions by reading the field notes: What are people doing or avoiding in this setting? What assumptions guide their behaviour? How do they perceive and discuss information among group members? Why did I include this information?
3. Begin line-by-line open coding of data and identify salient features.
4. Develop theories at each stage of data analysis, and modify them cyclically.
5. Create final theory from the notes and experience and produce final narrative.

D. Phenomenology: Its origin is in philosophy of existentialism and semiotics that deals with the meaning of symbols. Basic aim is to understand the life history of individuals to establish meanings applied to events and actions by them. Data are gathered through narratives, personal experiences and exhaustive interviews. *Meaning* related question is raised: how group members deal with various phenomena?

E. Grounded Theory Methods: It originated from sociology and social psychology. The aim is to develop theory out of the information gathered rather than testing the predetermined theories. Tools used are personal interviews, participant observation and studying personal diaries. A theory grounded in the gathered data is proposed after weighing alternatives. *Process* related question: what theory is embedded in the relationships between variables?

Steps:-

1. Identify the area of study and form a view.

2. Gather data through interview, observation and all possible sources.
3. Group the data in the initial categories and code them.
4. Identify relationships between categories.
5. Modify the categories with new data and continue this cyclic process till intuitively no new categories could be formed.
6. Develop a theory from the analysed data.

To qualify as a *grounded theory* it must exhibit the following characteristics: a) The theory must fit the topic and disciplinary area studied, b) The theory must be understandable to and useful to the actors in the studied situation and c) The theory must be complex enough to account for a large variation in the area studied.

F. **Action Science Methods:** Changing social system by studying the way it functions is the basic philosophy. *Critique* question is: what behaviours inhibit change?

Steps:-

1) Apply change experiments to the situation.
2) Repeat a cycle of problem identification – planning – acting – evaluation.
3) Educate members to change their thinking and action.
4) Encourage participation with full freedom in problem solving.
5) Ensure that the results should contribute to basic social science knowledge and improve the real life situation for the group.

Traditional Action Research is conducted in the location of social problem and involves the whole group. A single cause is studied and acted upon. Theoretical and technical skills of the researcher and practical knowledge and experience of the group are blended and suitable action for change emerges.

Participatory Action Research is its new form. This approach is concerned with research, education and action. This method got developed from social movements among oppressed societies in the developing countries. Educating people about the issue and making them aware of better ways to function can bring about the change themselves is its philosophy. Empowering people to take control of their situation is, therefore, envisaged.

G. **Empowerment Research Methods:** Its main objective is to empower the excluded groups due to variety of reasons to participate in the decision process.

Steps:-

1. Identify the excluded group.
2. Help the group to understand the underlying issues by collaborating with it.
3. Assist the group in gaining a voice and power in the decision that would affect it by bringing out the natural abilities of the group members.

H. Content Analysis: It is a quantitative analysis of written documents to describe attributes of messages (without reference to intentions). It is best suited for analysing simple and clear messages. Useful to analyse newspaper items, political manifestos and policy statements to develop preliminary understanding.

Steps:-

1. Determine objectives for the study.
2. Prepare a list of variables to be measured.
3. Determine what specific process to be used to measure each variable.
4. Determine the unit of analysis.
5. Develop coding scheme and select measurement scales.
6. Select the document or communication piece.
7. Select a random sample of the piece and pilot test the content.
8. Adjust the analysis categories or unit of analysis.
9. Analyse full sample using the revised code.

Computer software packages are now available to assist this process. Text mining is an advanced version of the content analysis that is performed using computer software tools.

I. Narrative Analysis: A narrative is an oral or written exposition describing say, events in personal or social life. A narrative is generally in time sequence and well structured – a beginning, middle and an ending. A narrative analysis is a qualitative approach to the interpretation of the text and supports content analysis. It is useful to analyse speeches, newspaper stories and Parliamentary or Legislative records for example.

J. **Discourse Analysis:** It is a method of analysing oral or written communications to identify formal structure of the message. It examines linguistic content – grammar and cohesion besides meaning. It is concerned with the theories of action, construction and variability in the message. It deals with theoretical organisation of texts and talks.

K. **Semiotic Analysis:** It deals with interpretation of signs and symbols in text, language, rituals, myths, art and tools and is widely used in many field studies. A sign is mostly grouped as: Icon (signifying meaning by quality of its own), or Index (communicating its meaning by being an example of its intended sign), or Symbol (similar to sign). Determining the contextual meaning of signs and symbols i.e. links between the things that signs represent and the people for whom they have meaning, is its focus. This method is quite useful for media studies and advertising research.

L. **Meta Analysis:** It supplements review of literature and deals with the analysis of the previously prepared research reports. It can be employed *only* to empirical research reports of the studies, which have used data gathering for conducting the primary research. It uses a set of quantitative techniques to synthesise the results of many types of studies (covering say, opinion surveys, co-relational and experimental studies, and regression analysis). It is time consuming, needs expertise, not sensitive to design issues, social context and mix of strong and weak studies.

Steps:-

1. Clarify the objectives of the analysis.
2. Set explicit criteria for selection of studies.
3. Justify methods for searching the literature.
4. Devise a standardised scheme/protocol to collect data from each study.
5. Describe in detail the statistical method for pooling results.
6. Do comparative analysis and prepare a report outlining conclusion and limitations.

9.4 Instruments

It is seen that to implement any of the above research methods gathering the data is crucial step. For that purpose field surveys or experiments are often carried out. Some of the main instruments used in this context are described below.

9.4.1 Questionnaire

This is the most widely used instrument to collect data like views, opinions and choices of the selected respondents. Designing a questionnaire is both science and art. Considering its great importance entire Chapter 11 is devoted to it. Reader is suggested to consult that Chapter to understand issues related to structuring and administrating a questionnaire in practice.

9.4.2 Personal Interview

Conducting one-to-one interview to gather the personal thinking directly is another way. For holding a successful interview the following points are important:

- Plan a conversation lasting from say 60 to 90 minutes (prepare the conversation guide).
- Questions should be straightforward, relevant, interesting and non-threatening.
- Attention and showing interest in the respondent's replies is very important.
- Eye contact and use of body language is useful (responding with nod, smile, seriousness and sympathy as per the nature of response).
- Flexibility to accommodate unexpected digression is essential.
- Trust building is crucial for the success.

Steps:-

1. A list of discussion topics be prepared.
2. Selection of interviewee/s be done according to the study needs (e.g. random selection or experts whose views are necessary).
3. Begin with two or three introductory questions (icebreaking questions).
4. Next ask a few transition questions explaining purpose of the research.
5. Then ask the key questions (these could be four or five, but could be more in an in-depth interview).
6. In the end summarise some of the main points discussed.

Take short notes during the interview that can be expanded later. Ideally recording the interview serves the best. Seeking the permission for recording the interview is always necessary.

9.4.3 Focus Group

A focus group is a group discussion in which 6 to 10 persons explore a specific set of ideas or issues under the guidance of a moderator or session leader. This method of data collection originated in marketing, but now extensively used in various types of research. Focus group sessions could be highly structured or less structured. It is quite effective for building or testing scenarios and obtaining a large amount of information efficiently.

Characteristics of *More Structured* Sessions:

a. To collect answers to the researcher's questions is the aim.
b. Discussion is strictly focused on questions.
c. Several specific questions are asked.
d. Time limit set for each question.
e. Group leader asks questions of each participant.
f. Participants talk to the leader.
g. Leader stops digression.

Characteristics of *Less Structured* Sessions:

a. To understand participants' thinking on the questions is the aim.
b. Questions are only for guiding the discussion.

c. More general questions asked.
d. Time allocation is flexible.
e. Leader is moderator, seeking interactions among participants.
f. Participants talk among themselves.
g. Leader permits exploring new directions.

9.4.3 Body Language Observation

Body language is also known as *Kinesics* or non-verbal communication. For certain types of studies the data in respect of body language is vital. It can help analysis of intentions. Video recording or shooting photos is useful to collect this data besides observations. Data on body actions, gestures and gaze behaviour as described below form the basis for analysis and interpretation.

Body actions are of the following types:

- Desired actions are those developed as one matures.
- Absorbed actions are those unconsciously copied.
- Trained actions are those specially learnt.
- Mixed actions are combinations of the above.

Gestures are a sub-group of actions to transmit a signal to the observer such as,

- Primary gestures are those which you perform alone and are non-social.
- Incidental gestures convey the mood. They further consist of mimicry, schematic, symbolic, technical and coded gestures.

- Baton signals like open palm, the air punch, raised fist etc. are widely used by politicians.

Gaze behaviour shows dominance or submission. Seating posture/arrangement is also important to understand the group dynamics.

Note: About 600 gestures are listed in Morris, D., *Bodytalk*, London, Jonathan Cape, 1994.

9.4.4 Projective Techniques

They are of the following types:

- *Association Techniques:* Participants are asked to express their first thoughts on observing a particular object like a word, sign or picture. It helps to understand underlying values conveyed by the object.
- *Construction Techniques:* Participants are asked to create a story to reflect their underlying values.
- *Completion Techniques:* Participants are asked to complete a sentence with any statement they wish and for a picture they can provide caption or dialogue among say two characters portrayed.
- *Ordering Techniques:* Participants are asked to arrange objects into some order or choose one or more items from a group of items.
- *Expressive Techniques:* Participants are asked to express themselves in any creative way say by drawing a picture or line drawing. They complement construction techniques

9.5 Mixed Methods

Combination of quantitative and qualitative methods under the mixed methods of research is gaining popularity in the social and human sciences. This is in line with the promotion of interdisciplinary research. The four factors that need to be considered for this approach are discussed below.

Timing: Whether data will be collected simultaneously or in phases is to be decided in advance. When qualitative data are collected first it means idea exploration is intention. It could be followed by large scale data collection for quantitative analysis. However, to collect data of both types concurrently is the usual practice to save on time.

Weighing: How much weight or priority is to be given to qualitative and quantitative analysis is a very important decision. It is governed by the nature of research and consumer or audience of the study.

Mixing: Merging of quantitative and qualitative data is known as mixing. For some part of the study analysis on the mixed data is performed and for other parts both the data sets are analysed separately.

Theorising: The theories underlying research are the key factors in steering the study. In a mixed method-based study such theories may be referred explicitly or otherwise. Activities like deciding types of questions to be asked, who would be the participants in the study and how data are to be collected are governed by such a design.

It is clear that various procedures for a mixed methods study arise by considering different combinations of the above four factors. The six major research designs are: 1) sequential explanatory, 2) sequential exploratory, 3) sequential transformative, 4) concurrent triangulation, 5) concurrent embedded and 6) concurrent transformative. The availability of time is a critical factor in selecting the research design.

Corresponding to each design of mixed methods study the suitable sampling strategy is to be employed (See Chapter 10 for various sampling methods). Similarly various schemes and procedures for data analysis, results validation and report writing are available in literature.

[Refer Sr. No. 12 and 48 under the Bibliography for mixed methods research for further details]

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Chapter 10

Sampling Methods

10.1 Concept of Sampling

More often than not a researcher is required to assess or project some characteristics of a group, community or a very large section of a given society through a well organised study. For example, travel behaviour of city dwellers, entertainment mode preferences of masses and impact of certain policy, service or product across a region is to be investigated in practice. Similarly in manufacturing sector it is not possible to check each and every piece for the defects. It is clear that observing every member of a large populace is impractical.

In such situations a different strategy is to be adopted. The common way out is to select a few typical representatives from the group whose study could facilitate estimating or predicting the whole group characteristics with reasonable degree of confidence. When examining the whole population or universe of the given entity is beyond normal means this is the recommended strategy. Sampling theory deals precisely with this issue. It provides several concepts and procedures to make the desired estimate for the larger entity based on the study of a small manageable sample drawn from it.

Voluminous literature is available dealing with several aspects of the sampling process in the discipline of Statistics. Its application ranges from the fields of agriculture to marketing to zoology. Empirical research studies in almost all the disciplines take recourse to the sampling at one stage or the other.

10.2 Need for Sampling

Under the following conditions recourse to the sampling is imperative:

- Conducting census or a study of whole population is not feasible.
- Availability of limited resources for the study.
- Greater coverage is necessary.
- To minimise the error in data collection and processing.
- Destructive testing is essential in certain cases (e.g. testing the life of an electric bulb).

10.3 Definitions

10.3.1 Population

‡ Entire set of subjects or individuals of interest for the study is called population.

‡ A *'target population'* is the group defined by the researcher's specific interests. Individuals in the target population typically share one characteristic.

‡ In practice however, *'accessible population'* alone may be studied from which the sample may be drawn.

Population is also designated by the term 'universe' in literature.

10.3.2 Sample

♦ A *'representative sample'* is a sample with the same characteristics as the population.

- A *'biased'* sample is a sample with different characteristics from those of the population.
- *'Selection bias'* or *'sampling bias'* occurs when subjects are selected in a manner that increases the probability of obtaining a biased sample.

For example, a researcher wishes to assess the prevalence of sleeping disorder among police force in a city. That would constitute the target population. To cover them all would not be possible; so the police force deployed in a particular zone (like ward) or branch (like traffic) treated as accessible or sampled population may be considered for drawing the sample. If proper sampling methods are used to draw a sample, then fairly reliable inferences can be drawn about the sampled population on its basis.

10.4 Sampling Theory Principles

Underlying the sampling procedure are three theoretical principles. They guide the selection of the appropriate method for drawing the sample. These principles are:

I. **Principle of Validity** – estimates obtained from the sample could be interpreted in terms of probability, which implies the absence of bias and accuracy of the estimate.
II. **Principle of Statistical Regularity –** any randomly selected sample element should possess the characteristics of the population.
III. **Principle of Optimisation –** achieving given level of efficiency with the minimum possible resources.

10.5 Sampling Steps

In a research study sampling exercise is a well-defined process. Its steps are as given below.

1. Statement of objective
2. Definition of the population to be studied
3. Determination of sampling frame (listing of all the elements in population or universe)
4. Determination of sample size
5. Selection of sampling method
6. Sample drawing and field work
7. Determination of sampling error

Technically the above seven step procedure constitutes a *sampling plan*. We shall discuss them in the following sections.

10.6 Sampling Frame

Before proceeding with sampling, it is necessary to have idea about the size of the population or universe from which a sample is to be drawn. It is desirable that its listing is available and that should be,

- ✓ Complete,
- ✓ Accurate,
- ✓ Up-to-date and
- ✓ Adequate.

Use of the list of voters, list of ration card holders and telephone directory in the Indian context as the sampling frame must done with caution as these may be under-represented or dated to a considerable extent. Various sources should be tapped to get reasonably good sampling frame pertinent to the study.

10.7 Sample Size Selection

There are quite a few methods to determine appropriate sample size. They depend on the level of accuracy one desires and degree of confidence for prediction. They are statistically expressed in the following form:

- Level of confidence like 95% (use corresponding ‘z’ value from the Normal Distribution Table),
- Standard deviation (s) or proportion (p) of occurrence obtained from say, a pilot study, and
- The permitted error (e).

The sample size ‘n’ is then determined by

$$n = (zs/e)^2$$

or

$$n = z^2p(1-p)/e^2$$

It is interesting to note that this formula does not depend on the population size.

Example 1:

The sample size ‘n’ to test whether 50 per cent of a group of 4000 people would attend the election campaign meeting with the marginal error of 5% and with 95% confidence is obtained as given below.

Here $p = 0.5$, $e = 0.05$ and coefficient $z = 1.96$, (taken from the Normal Distribution Table). Making use of the above formula involving proportion the sample size is given by,

$$\begin{aligned} n &= z^2p(1-p)/e^2 \\ &= (1.96)^2\ (0.5)(0.5)/(0.0025) \\ &= 384. \end{aligned}$$

Normally, the sample size should not exceed five percent of the population is a thumb rule and its variation is dictated by the practical factors.

10.8 Errors

10.8.1 Sampling Error

Sampling error is defined as the difference between the value of the actual population parameter (like mean) and the sample mean statistic. It can be minimised by increasing the sample size. Sampling error is the inaccuracy arising from the use of a sample.

Example 2:

Let to a random sample of 600 people a question about their support for the current agitation was asked. Of these, 45% say they support it. According to the table given below the sampling error of ±4% is expected corresponding to this sample size. That means one can be sure that at 95% confidence level, *support of the total population will be between 41% and 49%.*

Error *versus* Size at 95% confidence levels

Sampling error %	Sample size
±1	9604
±2	2401
±3	1067
±4	600
±5	384
±6	267
±7	196
±8	150
±9	118

It can be seen from the above table that the accuracy is proportional to the square root of the sample size. That means for reducing the sampling error the sample size is to be increased appreciably, which could be prohibitive in real life. A prudent decision about the acceptable sampling error must therefore be made by the researcher.

10.8.2 Non-Sampling Error

- Non-response or refusal by the sampled respondents to participate in the study or loss of their mailed response in transit
- Biased observation
- Processing lapses

Techniques are available to estimate the impact of these errors.

10.9 Types of Sampling

10.9.1 Probability Sampling

1. *Simple Random sampling:* Each element or unit in the entire population has an equal chance of selection. Use either the Lottery system or Random Number Tables to pick up the sample till the desired number of units is selected. It is simple to implement but is time consuming and laborious when the sample size is large.
2. *Systematic sampling:* The first unit is selected randomly, but thereafter, the units are selected according to a systematic plan (sampling interval like every fourth unit). Systematic sampling will be more precise only if units within the sample are heterogeneous. It is simple in operation but should be used with caution for the population with periodicity.
3. *Stratified Random sampling:* The population is divided in non-overlapping homogeneous groups called strata and sample unit is selected randomly from each stratum either by equal allocation logic or in proportion to the number of units in a stratum or according to any designated scheme. It provides a better cross-section of the population and brings a more precision to the estimate.
4. *Cluster sampling:* The population is divided in large number of segments called clusters and the required number of clusters is selected either by equal or unequal probabilities of selection and all the units in the selected clusters are surveyed. Though it is statistically less efficient than the simple random sampling, it is less costly for covering say, a large area.

5. *Multi-Stage sampling:* It consists in first selecting clusters and then selecting specified elements from each cluster. It is found useful for large surveys. It is a combination of simple random sampling and cluster sampling methods and is performed in stages.
6. *Multi-Phase sampling:* For successive estimation of the same parameter the multi-phase sampling is recommended. In the first phase a large sample is drawn and then further samples are drawn in different phases. It provides more precision and economy. It however requires enumeration of complete sampling frame.
7. *Successive sampling:* It is useful when surveys are to be repeated periodically to estimate the change in the value of certain parameters. Here some sample elements from the previous surveys are included to analyse the continuity effect. If sampling on successive occasions is done according to a specific rule, with partial replacement of sampling elements, it is known as *rotation* sampling.
8. *Sequential sampling:* Here instead of a fixed sample size on each occasion, successive samples size may be decided based on the previous outcomes or in the light of some new information obtained. This is quite useful in scientific studies and detecting frauds.

Remark 1: Multi-Phase, Successive and Sequential sampling methods are useful for the longitudinal studies and studies employing mixed methods of research.

10.9.2 Non-Probability Sampling

A. *Convenience sampling:* It is used in exploratory research for getting a gross estimate of the results, without incurring the cost or time required to select a random sample (using what is immediately available; also called as *Accidental* sampling).

B. *Judgment sampling:* It is an extension of convenience sampling. For example, one may decide to draw the entire sample from one 'representative' college, even though the population includes all colleges.

C. *Quota sampling:* It is the non-probability equivalent of stratified sampling. Here the strata and their proportions as they represent in the population are fixed. Then convenience or judgment sampling is used to select the required number of units from each stratum.

D. *Snowball sampling:* It is used when the desired sample characteristic is rare or it is extremely difficult to locate respondents, like in the AIDS studies. Here one element leads to another and so on.

Remark 2: It is interesting to note that by incorporating the use of new personal digital assistant technology a technique of *experience* sampling has been developed. It enables collection of data in real time on how selected people feel about the service or environment provided.

Limitations:

Results based on the non-probability sample-based study suffer from the weaknesses mentioned below.

- Non-representative in nature.
- Biasness is not filtered.
- Questionable for generalisation.

In such a case one has to interpret the results modestly and desist from large-scale generalisation.

Remark 3: Sometimes samples from both probability and non-probability sampling methods are obtained, but the analysis is done separately and their results are compared for agreement and inferences are drawn accordingly.

10.10 Theoretical Sampling

If the aim of the research is to develop a theory like grounded theory as described in Chapter 9, this type of sampling strategy is to be employed. Here extent of the basic population and its features are not known in advance. So the procedure followed is,

- Sampling elements are to be drawn repeatedly with criterion to be defined afresh at each cycle.
- Sample size is not determined in advance and would vary in each cycle.
- Sampling is finished when theoretical saturation has been reached.

[Refer Sr. No. 22 and 27 under the Bibliography]

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Chapter 11

Research Questionnaire

11.1 Questionnaire Purpose

In a survey-based research questionnaire is usually employed to obtain information of the following types keeping in view the research objective and issues:

- ☐ What people are (e.g. age, gender and status)
- ☐ How people think (e.g. opinions, beliefs and attitudes)
- ☐ How people act (e.g. behaviours and actions)
- ☐ What people know (i.e. awareness, familiarity and knowledge)

11.2 Features of Questionnaire as a Measurement Tool

11.2.1 Validity

Validity means the extent to which a questionnaire measures the thing we wish to measure. It is constituted by the following three components:

1) *Content Validity:*

What elements constitute adequate coverage? It means which questions or items to be *included* and *scaled* in the questionnaire.

Ideally, for each question (item) how many panelists out of the total (N) have indicated it to be essential (n_e) is noted and Content Validity Ratio (CVR) is computed by,

$$CVR = [(n_e) - (N/2)]/(N/2).$$

Questions with high value of CVR (say greater than 0.6) should only be retained in the questionnaire.

In short, content validity requires measuring the degree to which questions or items relate to the study aim. Generally the Judgemental and Panel evaluation methods as described above are used to establish it.

2) *Criterion-Related Validity:*

Success of measures used for prediction or estimation by question is to be judged by the following four criteria:

i. *Relevance* (what is important: Bank branch total deposit or the number of accounts with it, say for market penetration)
ii. *Freedom from bias* (adjustment for conditions in evaluating say, performance of students, salespersons)
iii. *Reliability* (stability and reproducible like bank branch deposit should be assessed on quarterly and not weekly basis)
iv. *Availability* (information must be available for evaluation or it is to be purchased at cost)

Criterion is a standard against which a test or test score is evaluated. It is further factored in the following:

Concurrent Validity, which is an index of the degree to which a test score is related to some criterion measure obtained at the same time (concurrent). For example, how well does new Test 'A' compare with the established or Standard Test 'S'? Correlation between independent and dependent variables is used to measure it.

Predictive Validity, which is an index of the degree to which a test score can be used to predict some criterion measure. Like use of Pre-admission Test score to predict the Final Examination score. Correlation of the dependent variable over time is used to measure it.

In other words validity coefficient and expectancy help establishing criterion-related validity through statistical evidence.

3) *Construct Validity:*

A construct like questionnaire-based score is an informed scientific idea developed to explain or describe behaviour. For example, anxiety, creativity, executive potential, intelligence and trust could be expressed through some operational means like index. What accounts for variance in measure by say judgment, correlation, convergent discriminant technique or factor analysis establishes the construct validity. The following are the sub-components of the construct validity:

Convergent validity, which shows how far results using new construct match with those of the standard or available ones.

Discriminant validity, which shows degree to which scores on a scale do not correlate with scores from scales designed to measure different constructs.

Note 1: The test of the Cronbach's Alpha shows that a particular question is inadequate, maybe due to some misunderstandings for the negative formulation of the sentence.

11.2.2 Reliability

Reliability means the ability of measurement instrument like questionnaire to measure the same thing consistently each time it is used. It is formed by the following elements:

a. *Precision:* it signifies perfection in an instrument (quality of the process).
b. *Accuracy:* it refers to how close an estimate is to the true value (quality of the result).
c. *Stability:* it means consistent results are obtained.
d. *Equivalence:* it concerns with variation at a given point of time among observers.
e. *Internal Consistency:* it deals with homogeneity among items (using say *split-half* technique).

11.2.3 Practicality

Practicality means the conduct economy, ease in administration, and interpretability. That drives the length of the questionnaire in the form of number of questions, convenience in handling and ease in interpretation by others.

Note 2: Validity presumes reliability but the opposite is not always true.

Note 3: Sometimes the concepts of *accordance* (the proportion of pairs of samples give the same response when analysed under repeatability conditions) and *concordance* (the proportion of pairs of samples that give the same response when analysed under reproducibility conditions) are to be used as measures of variation in qualitative response to the question.

11.3 Questionnaire Constituents

11.3.1 Format

A questionnaire (conventional postal, e-mailed or web-based) will usually have the following features:

- Covering Letter: a formal letter introducing the researcher, topic and sponsor, if any and ensuring that the anonymity of the respondent would be maintained in all respects.
- Questionnaire Lay-out: a neatly designed and well-spaced questionnaire inducing the respondent.
- Questionnaire Length: a compact questionnaire that could be filled in reasonably amount of time is expected. A questionnaire having more than 10 pages would be deterring.
- Handling Procedure: clear instructions for returning the questionnaire are mentioned. For instance, a stamped and self-addressed envelope for returning the filled-in questionnaire is to be provided.

11.3.2 Contents

A questionnaire will usually have the following aspects with regard to its contents:

- Fill up Instructions
- Question Wording
- Order of Questions
- Clarification Notes

11.4 Questionnaire Design

A questionnaire should normally consist of three parts:

Part – I: covering administrative information of the respondent like place of work and address.
Part – II: covering personal details like education and age (only absolutely essential),
Part – III: covering the questions or information items.

A questionnaire soliciting response of the respondents is to be designed considering the two aspects namely, the questions or hypotheses defining the study and the strategy for analysing the answers. For this purpose a questionnaire mapping exercise is recommended as shown in Figure 11.1. According to it every research question or hypothesis is first associated with the questions in the questionnaire. This exercise would ensure that every research question is addressed by some questions in the questionnaire. It helps in developing a balanced questionnaire. Next the question or group of questions from the questionnaire is mapped to the possible statistical or other analytical tools for analysis. This exercise is to be done in iterative manner so that the final questionnaire stands in a clear defined manner to the research questions on the one hand and analysis techniques on the other.

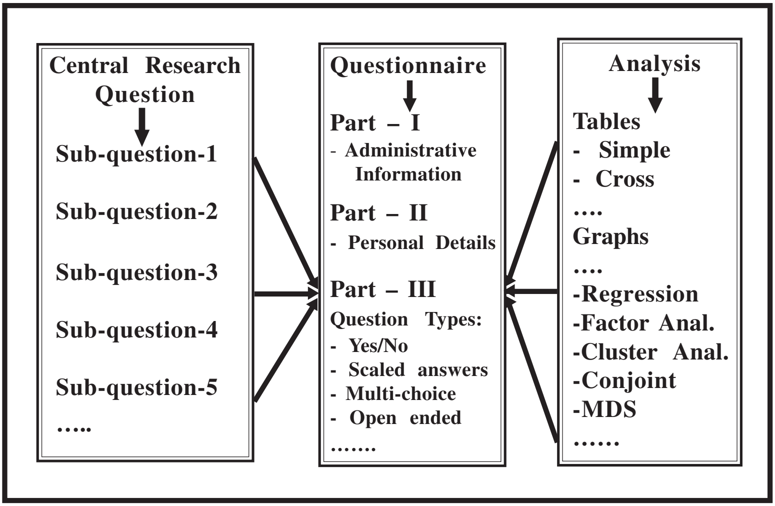

Figure 11.1 Questionnaire Mapping

11.5 Questionnaire Structure

The following arrangement is suggested for the questions in a questionnaire:

- Go from general to particular and from easy to difficult.
- Go from factual to abstract.
- Start with closed format questions.
- Answer options should generally be mutually exclusive.
- Arrange questions in logically coherent groups with smooth transition.
- Mix questions with semantic differential scales to avoid the tendency to tick the same response category for every question.

Length of the questionnaire depends on the scope of the study. All questions should be related to the study on hand alone. Make sure to inform the respondent if it would take more than 15 to 20 minutes to fill-in the questionnaire. Experience shows that to start with warm-up questions, then broad awareness questions, followed by more focused attitude and opinion questions and core or most focused questions and then classification type questions and open-ended questions yield the best response. The sequence of the questions should match the general span of attention is the key to obtain satisfactory replies.

11.6 Question Construction

11.6.1 Guidelines

- Use short and simple sentences.
- One question for one aspect only.
- Word should reflect the precise experience (e.g. for satisfaction consider ‘fair’ or ‘appropriate’ or ‘suitable’).
- Put “don’t know” option only for factual questions, not for attitude questions.
- Use words from the shared vocabulary.
- Define technical or unusual terms.
- Include pictures for clarification.

11.6.2 Cautions

- ➢ *Clarity:* Choices must be unambiguous e.g. for frequency, ask as once a week or a month instead of often and rarely.
- ➢ *Leading type:* Answer choice should not be forced or implied, it should have equal selection chance.

- *Phrasing:* Avoid positive or negative connotation and use the words carefully e.g. child-like and childish.
- *Embarrassing type:* Avoid uncomfortable personal question unless it is absolutely essential.
- *Double negative:* Avoid double negative type question like "Don't you think the LIC should not have withdrawn that policy?"
- *Hypothetical:* Avoid "if you were a President" type question.
- *Ego boosting:* Check the tendency by the respondents to answer in a way they feel better.

11.6.3 Use of WH Request Words

Use the following special "WH" words for framing the questions for covering different aspects as described below.

When: time
Where: location
Why: logic or reason
Who, Whose and Whom: information about a person or several people
Which: preference
What: subjective and objective evaluation
How: to measure a procedure, relationship, opinion, quantity, extremity, intensity

11.7 Ideal Question Formulation

In order to clarify the purpose of the question completely the following information elements are expected to be included in framing a question:

- Introduction (*INTRO*)
- Motivation (*MOTV*)
- Information about the content (*INFOC*)
- Information about a definition (*INFOD*)
- Instruction of the respondent (*INSTRR*)
- Instruction of interviewer (*INSTRI*)
- Request for answer (*REQ*)
- Answer categories (*ANS*)

Example illustrating incorporation of the above elements in a question:

We want to ask you about your education (*INTRO*). It is important for us to get a good picture of education of our community (*MOTV*). By "education" we mean schooling or higher education you finished for a certificate or degree (*INFOD*).

What was the highest education you finished with a certificate or degree (*REQ*)?

1. Primary school
2. High School
3. Vocational School
4. College
5. University
6. Any Other (*ANS*).

Obviously the questionnaire elaborating each question in such a minute manner would be unwieldy to handle. It is therefore suggested that only core questions could be detailed to such an extent.

Remark: the questionnaire should be in the local language for the ease of the respondents.

11.8 Response Measurement

Response to a question is captured in one of the following ways:

- ‡ *Rating:*- Scoring of an object done without comparing with other object directly
- ‡ *Ranking:*- Marking on the basis of comparison
- ‡ *Categorisation:*- Requesting respondents to place an object in one of the specified categories
- ‡ *Sorting:*- Requesting respondents to use given criteria to put objects in different groups

11.9 Response Category Quantifiers

Given below are some of the alternatives for capturing the response. The choice depends on the research strategy and the method of analysis to be used.

Opinions:

a. Completely satisfied
b. Mostly satisfied
c. Somewhat satisfied
d. Dissatisfied
e. Very dissatisfied

Or

a. Very important
b. Important
c. Not too important
d. Not at all important

Or

- Oppose/Support

Or

a. Strongly oppose
b. Oppose
c. Support
d. Strongly support

Frequency:

a. Never
b. Less than once a month
c. Once a month
d. Twice a month
e. More than twice a month

Or

a. Per day
b. Per week
c. Per month
d. Per year
e. Never

Or

- Always/Sometimes/Never

Or

- Often/Sometimes/Rarely/Never

Ratings:

- Excellent/Good/Fair/Poor

Or

- Very fair/Fair/Unfair/Very unfair

Or

- High/Medium/Low

Or

- Small/Medium/Large

Or

a. Got better
b. Got worse
c. Stayed about the same

11.10 Question Choice

It is advised to check the whole questionnaire by applying the following criteria:

- Should this question be asked? Is it related to the study objective?
- Is the question adequate in coverage?
- Can the respondent adequately answer this question?
- Will the respondent willingly answer this question?
- Should this question be asked of all respondents or of a subset? (if a subset, proceed only if subset is identified beforehand or through a previous question)

11.11 Measurement Scales

Scales most often used in a questionnaire-based research are:

1) Attitude scales: *Thurstone* scale, *Lickert* scale and *Guttman* scale are widely used.
2) Importance scales: Ordinal scale for importance ranking for all the listed measures or items is used. Here for example use of “1” for most important, “2” to next in importance and so on is the scheme.
3) Rating scales: Comparing two items in respect of some characteristics or criteria is done using say a scale varying from much more to almost same to much less is used.

[Refer Sr. No. 16, 18, 30 and 39 under the Bibliography for more details]

11.12 Administering a Questionnaire

The following means can be used to administer the questionnaire:

- *Face-to-face interviewing* either by the researcher or hired investigator. Response rate is high, data quality is better and process does not remain anonymous are some of its advantages. However it is costly, time consuming and may influence the respondent. Sometimes the respondent may be evasive to some questions because of the presence of the researcher or investigator.

- *Mail survey* by using attractively prepared questionnaire and providing self-addressed envelope with return postage is another popular method in a country like India. It is less expensive, can cover wider area, anonymity helps respondent to answer sensitive questions and consult others before responding. However the response rate is low and problem arises if only one type of respondents reply and some questions may not be answered or filling in the questionnaire might be delegated to someone else by the respondent.

- *Telephone survey* employing polite tone and not exceeding 10 minutes of the respondent is another method. Coverage by this method could be wide and good amount of response could be obtained. Further, data are collected in short time and since next question is not seen the answer to each question is given carefully. However, this method is not suitable for long questionnaires. Moreover respondent can be influenced, respondent may be evasive and language issues are some of the associated problems.

- *Internet or web-based survey* is now becoming popular because it provides efficient navigation scheme and hyperlinks for clarification. Low cost, short time and worldwide coverage are its advantages. On the other hand who answers the questions cannot be verified and non-Internet users are excluded. Longer questionnaires are not filled in completely is the experience.

It is always useful to *Test Tryout* or *Pilot* testing of the questionnaire in the environment similar to that for the final administration and to revise or modify it in the light of the feedback received (minimum five respondents for each question or item). In particular, analysis of the question for answering difficulty, reliability, and validity along with its discrimination power should be made. Consistency testing by introducing intercept questions or reverse scaling of some questions is recommended. Cross checking some of the filled-in questionnaires with the respondents is advised. A strategy in case of non-response or inadequate response to the questionnaires must be drawn by the researcher in advance. Training should be planned and imparted to the hired investigators.

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Chapter 12

Research Validation

12.1 What is Research Validation?

It is but natural to raise the following questions with regard to the research: How might one be wrong? Why should anyone believe in the results obtained by the researcher? The research validation addresses these core questions. Replication possibility implied by it testifies validity of research to a considerable degree.

Usually the term validation refers to internal consistency (i.e., a logical issue), whereas verification deals with justification of knowledge claims. However in some discussions these terms are found interchanged.

A strictly formal process can be used to validate the results of research creating the new knowledge as either true or false. Strict accuracy rather than practical use governs that validation procedure. But all problems are not *closed* problems having right or wrong answers like in mathematics. So, for the *open* problems where new knowledge is associated with qualitative representations a semiformal process called *Relativist* validation is to be employed. In this approach validation is perceived as a gradual process of building confidence in the usefulness of the new knowledge. A validation procedure of this type is a mix of quantitative and qualitative measures. Extensive work is going on to refine these research validity techniques and the researcher should keep track of it (for example, Pedersen, K., Emblemsvåg, J., Bailey, R., Allen, J. K. and Mistree, F., "Validating Design Methods & Research: The Validation Square", *Proceedings of the ASME Design Engineering Technical Conferences*, Baltimore, Maryland, September 10-14, 2000, pp.1-12.).

12.2 Instrument Validity

Research usually involves use of some instrument like a physical instrument for research in science or a questionnaire for research in social science. Elaborate methods for ensuring validity of the research instruments are in place and continue to evolve. Accuracy, precision, repeatability and reproducibility are some of the important parameters defining the validity of an instrument. In many instances a trade-off between the accuracy and precision is essential.

Some other measures for instrument validity are:

- Specificity, sensitivity and limit of detection of an instrument that must be considered while interpreting the research results.
- Content validity concerns the representation by the instrument of the content of a given construct in terms of measurement and substance.
- Discriminant validity distinguishes the reflection of the items to a specific construct from the items that reflect the other constructs. For this purpose confirmatory factor analysis, is used in practice.

Note: Checking the validity of a questionnaire is discussed in Chapter 11.

12.3 Data Validation

Data suffer from what is known as ‘method halo’ or ‘methods effects’ when data are collected by only one method. In order to reduce it the questions in the questionnaire are randomised.

To make sure that all data (whether entered by the researcher, read from file or a database) are valid for their form constitutes the other dimension of data validation. That means human error that can occur while feeding the data for computer processing must be eliminated in the first place. Checking the data matching with its coding scheme, if employed must be undertaken. Some error checking or editing software programming tools can be used for this purpose. They employ various strategies for checking the range variation (for numerical values), date validity and valid code string possibilities.

12.4 Validity Threats

The following are the two main threats for the validity of the research:

12.4.1 Research Bias

Quite often a researcher makes the data selection to fit his or her pet theory or preconceptions. That is why sample selection plays a very important role in the survey-based research. In other words the ways in which data collection and analysis are distorted by researchers’ theories or values must be understood and filtered out.

12.4.2 Reactivity

Influence of the researcher on setting of experiment leads to the results that may be reflecting a mere reaction and not the true opinions or views of the respondents. Selection of the environment like place for an interview can make a difference in the response received in practice. Similarly obtrusive data collection is to be avoided.

Note: In this context the famous *Hawthrone Experiment* is worth recalling. In that study a few workers randomly chosen from the industrial plant at Hawthorne of Western Electric Company (New Jersey, USA) were moved to a special location and subjected to variations in working conditions like lighting, period of rest and speed of machines. Surprisingly, performance of those workers increased with both positive and negative changes thus made. The reason put forward is that the workers having been singled out for attention made them to perform best despite degrading the working conditions. In practice such change is captured by *intervening* or *confounding* variables to represent the reactivity.

12.5 Causality Validation

The classical methods propounded by James Stuart Mill for testing the results of a study are worth employing to establish the causal validity. They are:

1. *The Method of Agreement* – proposed cause is present when the effect is observed.
2. *The Method of Difference* – proposed cause is absent when the effect is absent.

3. *The Joint Method of Agreement and Difference* – systematically adding and removing cause to observe the effect.
4. *The Method of Concomitant Variation* – study of the effect of intensity of cause on the effect.
5. *The Method of Residues* – eliminating other causes to isolate the cause for the effect.

12.6 Elaborate Checking

It is quite important that the results obtained by analysing the data are checked carefully before reporting. The following actions are suggested in this direction:

- Internal checking to safeguard against selecting wrong pattern as true.
- Avoiding faulty generalisation from single event or handful observations.
- Logical testing of arguments and examining the basic assumptions.
- Filling up information gaps.
- Checking for coherence that is, a *causal* relation among the variables must be established.
- Carrying out risk assessment or sensitivity analysis to test the stability of the results.
- Breaking the creation to examine for any flaw in any of the components, side effects, difficulty in use and changing the environment for variable testing.
- Testing through surveys, prototypes, and experimentation.

12.7 Select Standard Methods for Validation

a) *Modus Operandi Approach* i.e. to generate alternative explanations and eliminating them. It involves creation of cases that cannot be accounted for by a particular interpretation.
b) *Searching Negative Cases* i.e. to rule out the opposite possibilities.
c) *Triangulation Method* i.e. to gather supporting evidence from diverse sources. Using more than one investigator or comparing two data sets or two methods of data collection is to be employed.
d) *Respondent Validation* i.e. to check from the members of the sample used. It can effectively rule out possible misinterpretations or representations and filter out the biases of the researcher.
e) *Reflexivity* i.e. to examine the researcher's approach, experience and assumptions.
f) *Deviant Case Analysis* i.e. to perform analysis of the contradictory data or case.
g) *Feedback* i.e. to solicit review of the results by experts.
h) *Quasi-Statistics* i.e. use of some statistical techniques (like computing frequencies and variances) by drawing quantitative data from qualitative methods. It may enable to assess amount of data-based evidence in support or against the results.
i) *Comparison* i.e. to compare results from other studies.
j) *Parsimony* i.e. to ensure that the causes advanced as explanations for phenomenon are as simple as possible.

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Chapter 13

Research Writing and Publication

13.1 Research Writing Variety

It may be recalled that research process was described by the seven steps in Chapter 4. To that we add the eighth step at the top namely *dissemination of results*. That means making the results of the research known to wider audience – subject specific or even general. Importance of this should be realized because some of those results could serve quite a few individuals and institutions too. They can inspire someone to extend those results by the next round of research activity. The research process is cumulative in this sense.

So, the following steps complete the extended research process:

1. Identify the research problem
2. Establish research questions
3. Select the research strategy
4. Prepare a research plan and submit it as research proposal for approval
5. Gather the data according to the approved research plan or proposal
6. Analyse and interpret the data and validate the results
7. Prepare the final thesis or Report
8. Disseminate the results in due course

It is clear that writing for external consumption is largely involved at three steps: fourth, seventh and eighth step listed above. Style for writing the research plan or proposal and the final thesis or report is more technical because the readers of those would be subject experts and are familiar with the terminology. However, writing style at the eighth step would vary with the mode of dissemination. For instance, writing an article for a popular magazine will be quite different from that for writing a newspaper article or a blog.

Let us understand the important aspects of research writing at each of the three stages mentioned above.

13.2 Research Proposal Writing

It is essential to understand the purpose of the research proposal. The research proposal is expected to serve the following three main functions: 1) research intention, 2) specificity, and 3) adequacy of methods. That means outcome and focus of the research and how the proposed approach for conducting the research is sufficient become clear to the proposal reader or evaluator.

In other words, a research proposal is an argument that explains the logic of the study to an audience of non-experts. The term non-expert refers to the readers who may not be knowledgeable in the very narrow and specialised area of the proposed study. An explanation refers to the justification of the research in terms of importance and need of the study in the subject matter. A discussion about the methodology part refers to the approach, data collection strategy, analysis and validation aspects of the proposed study.

13.2.1 Research Proposal Features

An academic research proposal is generally expected to be written in 8,000 to 10,000 words. It should be divided in proper sections with suitable captions. Essential contents of such a proposal are:

- *Connectivity of the study:* Preparation of a research proposal is based on a limited amount of literature review about the topic. So the proposal should reflect how does the proposed research study connect with the literature and is informed by it.
- *Importance of the study:* It should establish that the proposal is a timely piece of research. It is viable and adequately worked out in most of its details.
- *Methodology aspects:* Researcher is aware of the strengths and limitations of the suggested approach should get reflected in the written proposal.
- *Ethical practice:* It is important that all the ethical issues are weighed up while selecting the methodology is clearly shown. This is assuming a great importance now.
- *Expected outcome:* A fair amount of original findings are expected at the end of the research should be indicated.

13.2.2 Structure of a Research Proposal

A doctoral research proposal is expected to have the following sections:

- Title of the Thesis

- Problem Statement
- Research Objectives or Questions
- Literature Review
- Importance of Study
- Research Design incorporating Ethical Aspects
- Data Analysis
- Form of Results
- Schedule (may be optional)
- Tentative Scheme of the Thesis Chapters
- References

It may be noted that the title of the Ph.D. Thesis is usually frozen by most of the universities on approval of the research proposal. That is why great care should be exercised in its selection. Stick to the approved title as far as possible because major deviation can lead to several complications at the submission of the doctoral thesis.

Remark 1: It is observed that research proposal is sometimes called as research synopsis. However, synopsis is the term normally used to denote the summary of the research completed and is to be submitted to the concerned committee of the university to give idea of the work done so as to appoint the examiners for the proposed thesis. On approval of the said synopsis the candidate is expected to submit the final doctoral thesis within a stipulated time period.

If the proposal is regarding a research-based Consultancy Study (e.g. invited by a government agency) then it could be a lengthier document depending on the nature and scope of the work. In that case in addition to the above the following elements are to be included:

- Executive Summary
- Table of Contents
- Personnel and Internal Resources that would be employed
- Budget and Financial Terms
- Special Facilities, if required
- Study Management Mechanism
- Appendices containing CV of the experts involved and other secondary information that may have a bearing on the study

13.2.3 Schedule of a Research Study

A typical short term research study schedule is depicted in Figure 13.1. It may or may not be required for inclusion in the doctoral research proposal. It is however useful to the researcher for self-monitoring the progress and initiate course correction actions, when considered necessary. For a research-based consultancy proposal such a schedule is *mandatory* in practice.

A schedule shown in Figure 13.1 can be suitably modified for a study on hand. It may be noted that the activities of literature search and literature review shown by the broken lines would continue till the report writing stage. A cognisance of the latest developments is thereby ensured.

Remark 2: A research proposal for minor or major research project funding by the agencies like the UGC or ICSSR will have most of the above elements, only differing in the order perhaps. Their respective web site makes available the requisite application forms and guidelines for the submission.

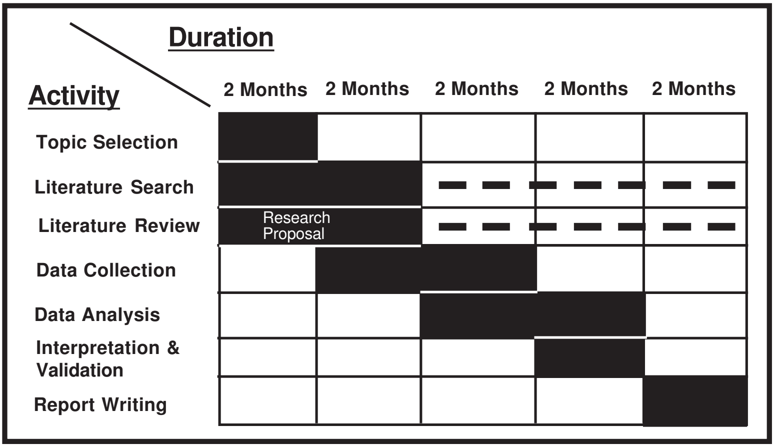

Figure 13.1: A Study Schedule

13.3 Academic Thesis Structure and Writing

Academic thesis writing follows a prescribed style or pattern to some extent. The structure, that is Chapter scheme, can of course vary depending on the subject discipline or a specific topic. The researcher should decide in consultation with one's Guide or Supervisor about the composition of the final written presentation. Consulting the previous approved doctoral theses in the subject area and the institution for this purpose would be of great assistance. Here we would describe the elements that should be covered in general in any research thesis; order could be changed as stated above.

13.3.1 Preliminary Pages

- Title or Cover Page: should give the Title that may be suitably framed. It is suggested to confine it to 12 to 16 words and to avoid a repetition of the main word. Consider including the name of the technique or concept or geographical region or time period or any significant feature to highlight the scope and specificity of the contribution. It is to be followed by

- Name of the Researcher
- Name of the Guide/Supervisor (as per the practice)
- Department and University
- Month and Year

- Other Pages
  - Certificates as per the prevailing Rules (*Follow the prescribed format)*
  - Acknowledgements: be selective in extending the gratitude. Limit it to those who had significantly served you in the conduct of your research work that is being reported. It is recommended that do not talk about possible errors in the thesis for which you owe the responsibility. That gives an impression that the thesis contains errors.

- Table of Contents
  - Chapter Number and Title… Page No.
  - Section Headings - “ -
  - Sub-Section Headings - “ -
  - References - “ -
  - Appendices - “ -

- List of Tables (with No. & Caption) Page No.

- List of Figures (with No. & Caption) Page No.

- Glossary of Terms (optional)
  - Definitions

  - Acronyms

- Summary of the Thesis
  - Contents of each Chapter in brief
    (Write the summary precisely as that is read first by the examiner to form the basic Impression)

13.3.2 Thesis Chapters

- **Chapter 1: Introduction**
  - Subject background
  - Thesis topic background
  - Motivation for selecting the topic/problem
  - Broad definition of the problem
    (Sometimes the Summary of the Thesis or Review of Literature is included in this Chapter)

- **Chapter 2: Literature Review**
  - Organised according to either authors or geography or chronology or variables
    (Give your critical evaluation to show the state of the knowledge, the gaps and direction you would take. Provide arguments why you agree or do not agree or partially agree with the other authors)

- **Chapter 3: Scope of Work**
  - Problem statement (precise definition)
  - Sub-Divisions of the problem
  - Corresponding *hypothesis* formulation (if applicable)

- **Chapter 4: Methodology**
  - Possible approaches
  - Justification for the selected approach
  - Operational aspects of the approach

- **Chapter 5: Data Collection**
  - Types of experiment or field investigation
  - Sampling frame (relevant universe)
  - Sampling procedure (sample selection)
  - Outline of the instrument that is used like questionnaire and interview schedule; only highlight and discuss its most important elements and full instrument should be provided in the respective Appendix

- **Chapter 6: Analysis**
  - Salient features of analytical tools used
  - Main Tables and Figures (exhaust all the collected data)
  - Results validation

- **Chapter 7: Discussion of Results**
  - Critical interpretation of the results
  - Linking the results of the sub-problems
  - Implications for the main problem

- **Chapter 8: Conclusions**
  - How the purpose of the study is addressed
  - Limitations
  - Areas for further research

- **References**
  - All the quoted works to be listed
  - Use standard style (like Chicago Manual or American Psychological Association)
  - General works be given separately as Bibliography, if large in number
  - Follow prescribed style for citing even the Internet or Web-based works
    (Use original works, latest works and do not miss any important work; Examiners are usually particular about these aspects)

- **Appendices** (one for each aspect)
  - Full questionnaire and/or interview schedule
  - Secondary Tables/Figures/Maps
  - Other supporting documents like newspaper clippings, brochures and leaflets
  - Technical notes about methodology, if considered relevant
  - Any other information that may have some bearing on the work reported

13.3.3 Research Thesis Writing Guidelines

- ✓ Use "we" instead of "I" (or author/writer/researcher)
- ✓ Avoid the use of superlatives (this the best work on this topic)
- ✓ Use mix of active and passive voices in the sentences
- ✓ Be exact; avoid the use of the words like "etc.", "about 35…." and "nearly…"
- ✓ Keep the sentences short
- ✓ Use "&" only occasionally and use "and" most of the time

- ✓ Describe the methodology and fieldwork in the past tense
- ✓ Use the present tense for describing your analysis and conclusions
- ✓ Do not use slang or jargon form of expression, unless justified
- ✓ Do not present same information in text, table and picture form
- ✓ Remember accuracy is more important than artistry in the research writing
- ✓ Ensure that any new term or concept is defined before it is used
- ✓ All statements must be backed by relevant data and evidence/ reference
- ✓ Follow one idea, one paragraph approach to make desired impact
- ✓ Use graphics selectively to enhance the presentation quality
- ✓ Divide the matter in sub-sections and give them suitable captions for clarity
- ✓ Writing flow must have a logical progression of ideas
- ✓ Ensure proper linkage between paragraphs, Sections and Chapters
- ✓ Avoid repetitive citing of the same reference/s (restrict it to say, three or four times)
- ✓ Refer Dictionary for correct spelling and check punctuation and grammar (decide about the American or British English spellings to be used and employ that style consistently)
- ✓ Use Thesaurus to improve the writing (e.g. "….and their conversation was noted." Alternatively, "… and the interaction between them was noted.")
- ✓ Use standard style manuals for citing the reference in the text and listing the references
- ✓ Never do copy-pasting of the Internet downloads

Note: A software template like LATEX can be used for preparing the thesis. This free software can be downloaded from the web sites: 1) http://www.ctan.org or 2) http://www.miktex.org

13.3.4 Style for Table

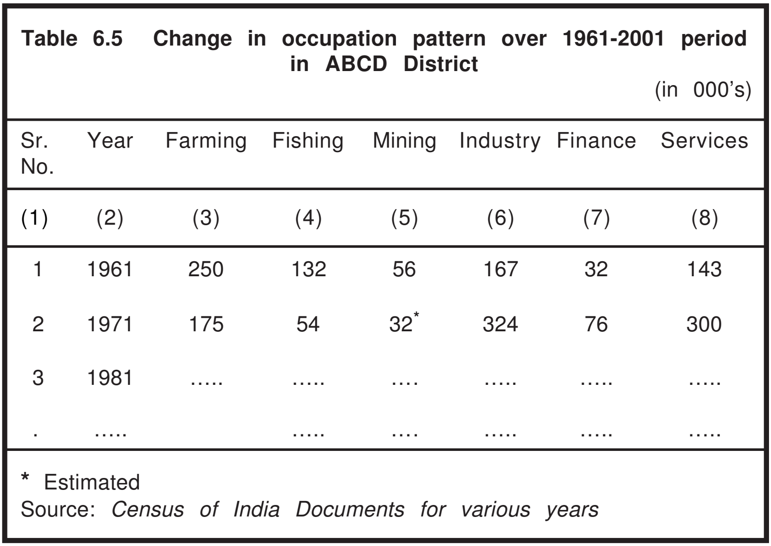

Table 6.5 Change in occupation pattern over 1961-2001 period in ABCD District

(in 000's)

Sr. No.	Year	Farming	Fishing	Mining	Industry	Finance	Services
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	1961	250	132	56	167	32	143
2	1971	175	54	32*	324	76	300
3	1981	.....	.....	....	.....	.....	.....
.	.....		.....	....	.....	.....	.....

* Estimated
Source: *Census of India Documents for various years*

Figure 13.2: A Sample Table

As shown in Figure 13.2 the caption or the title of the table is to be given on the top. It may be suitably numbered for instance, 6.5 before the caption in the above table means it is the fifth table in the Chapter six. If the number of columns of a table exceeds five it is better to number them. That helps in referring them easily in the discussion, Give unit or scale used and appropriate note/s to make the table self-explanatory. Also give the source, if it is reproduced.

13.3.5 Style for Figure

For the figure the caption or the title is to be given below the figure as shown in Figure 13.3. It may be suitably numbered for instance, 6.3 before the caption in the above figure implies it is the third figure in the Chapter six. Suitable legend and scale used must be invariably provided for clarity. The source may be given if it is borrowed. It is recommended to employ different line patterns like solid and dashed to make the distinction, if the figure or graph is produced in black and white mode instead of the coloured one as shown the Figure 13.3.

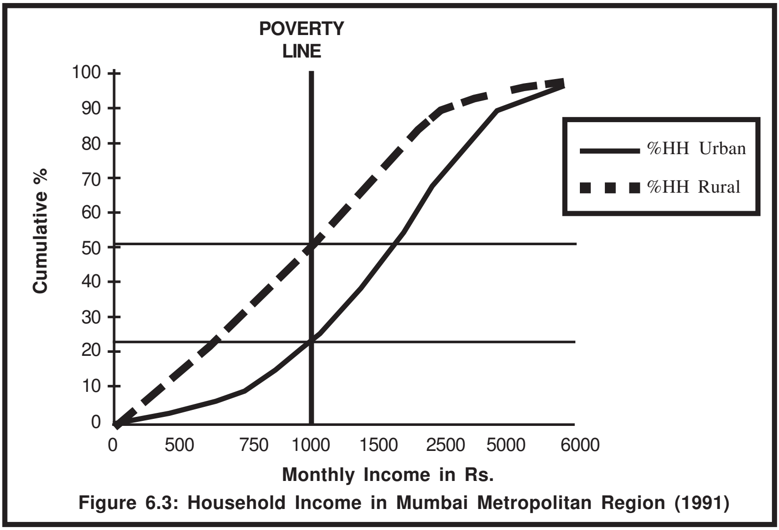

Figure 13.3: A Sample Figure

13.3.6 Bibliographic Style

Several style manuals are available to describe the details of the source. They generally group the sources in the below given categories:

1) book
2) periodical (e.g. journal, magazine)
3) miscellaneous item (e.g. report, brochure)
4) electronic resource (e.g. website, blog)

The following are the standard and widely used styles in social science research:

- American Psychology Association (APA) [visit www.apastyle.org]
- Chicago Manual of Style (Chicago Style) [visit www.chicagomanualofstyle.org]
- Modern Language Association of America (MLA) [visit www.mla.org/style]

Some disciplines have brought out their own style manuals like law, computer science and environment & earth sciences. One has to consult the Guide and prescribed guidelines, if any for this purpose and follow one style consistently. It is suggested that one should visit the web sites as mentioned above to see the latest revisions that may have been introduced. Given below are sample illustrations of the above three styles for different documents to bring out the differences. They are given in the APA, Chicago and MLA styles, respectively:

Book

- Berg, B. (2001). *Qualitative research for the social sciences*. London: Allyn & Bacon.
- Berg, B., *Qualitative Research for the Social Sciences*, London, Allyn & Bacon, 2001. [include subtitle, if it is present]

- Berg, Benjamin. *Qualitative Research for the Social Sciences*. London: Allyn & Bacon, 2001. [For the university press as publisher alone add the term UP, for example, Mumbai UP to denote Mumbai University Press as the publisher]

Journal

- Patkar, V.N. & Sampathkumar, D. (1993). A GIS support to water distribution, planning and management. *Journal of Indian Water Works Association*, 25(1), 141 147.
- Patkar, V.N. & Sampathkumar, D., A GIS Support to Water Distribution, Planning and Management, *Journal of Indian Water Works Association*, 25(1), 1993, pp. 141 147.
- Patkar, Vivek N. & D. Sampathkumar, “A GIS Support to Water Distribution, Planning and Management.” *Journal of Indian Water Works Association*, Vol. 25, No.1, (January 1993): 141 147.

Miscellaneous Document

- Patkar, V. (2010). *Information and communication technology age: a perspective*. Mumbai: Centre for International, Strategic and Development Studies. CISDS Publication – 4.
- Patkar, V., *Information and Communication Technology Age: A Perspective*, Mumbai, Centre for International, Strategic and Development Studies (CISDS), March 2010, CISDS Publication – 4.

- Patkar, Vivek. *Information and Communication Technology Age: A Perspective.* Mumbai: Centre for International, Strategic and Development Studies, March 2010. (CISDS Publication – 4)

Electronic Resource

- The British Library. (2005). *Measuring our value.* London: The British Library. Accessed on July 30, 2008 from http://www.bl.uk/pdf/measuring.pdf
- The British Library. *Measuring Our Value*, 2005. London: The British Library. http://www.bl.uk/pdf/measuring.pdf. Accessed on 30th July 2008.
- The British Library. *Measuring Our Value.* 2005. http:/ /www.bl.uk/pdf/measuring.pdf. 30 July 2008.

Consider providing an exclusive *Webibliography* in case web references are exceeding, say 15.

Remark 1: These style manuals are revised periodically and therefore consult them at the time of the thesis writing to know the then prevailing style.

Remark 2: Quite a few word processing software products can organise the references in some of these standard reference styles. It is recommended to explore that option to save on time.

13.3.7 Quality Issues

A commonly asked question is regarding the length or the number of pages a doctoral thesis should have. There cannot be such a rule and presenting the research process and results adequately should be the main concern. A sort of thumb rule says that a social science Ph. D. thesis comprising around 350 pages of the main text be considered ideal (using standard font & size and one and half line spacing), whereas in sciences the corresponding figure is 250 and in mathematical science it is 150.

Further, from the balance of the content angle the following could be used as a guideline regarding the distribution of words for the main body of the thesis that is, excluding Preliminary Pages, Table of Contents and References:

1.	Introduction	05%
2.	Theory and Literature Review	30%
3.	Method of Data Collection	15%
4.	Data Description	20%
5.	Analysis and Discussion	20%
6.	Conclusions & Implications	10%

In order to make reading the matter easy it is suggested to keep the sentences short and simple. Given below is a rough scale to judge the ease in reading and understanding a sentence (out of total number of readers how many find it easy is stated in percentage in the corresponding bracket):

- Up to 8 words — Very easy (90%)
- 11 words — Fairly easy (75%)
- 17 words — Standard (40%)
- 21 words — Somewhat difficult (24%)
- 25 words — Difficult (14%)
- 29 words and more — Very difficult (4.5%)

It is advised to use gender neutral words like chairperson instead of chairman as far as possible.

A good balance between the text, tables, charts and other graphics should be maintained. Same information should not be presented in all these forms. Do not use words in ALL CAPITAL, **Bold**, *Italics* or Underlined form excessively. Overdoing loses their emphatic significance.

Writing of the academic thesis or research report must be clear and crisp. Logical flow among the Chapters and Sections needs to be maintained. A doctoral thesis, in particular, is considered complete when,

- All objectives are addressed completely and specific conclusions are drawn.
- Due credit to all previous works is given by inclusion in References/Bibliography.
- Sufficient procedural information is given to enable others to replicate the study (that is, data sources, sampling plan, survey instruments and methods for analysis are presented in all details).
- Repetition is avoided.
- Limitations of the study are stated.

13.3.8 Thesis Defence

Viva-Voce or oral defence of the Thesis is the last step for obtaining the doctoral degree. It could be a closed examination where only the Examiners would ask the questions. Alternatively, it could be open or public defence where all those present could ask the questions of the researcher. In some institutes both the modes are employed in separate rounds.

Generally the researcher is given 20 to 25 minutes to explain his whole work. It is expected to be done using slides like a PowerPoint presentation. The following guidelines are suggested with regard to those:

- Prepare the slides a fresh and independently i.e. avoid copy-pasting from the Thesis.
- Ideally the number of slides be around 25.
- Avoid covering literature section presentation through slide; just mention the most influential or critical works that have been used.
- Be precise; highlight your own contribution to the maximum extent.
- Slides should be error free.
- Use standard font, size and colours.
- Avoid using animation in the slides.
- Have a prior trial of your presentation to your Guide and colleagues to check about the time taken and possible areas for improvement.
- Anticipate questions; reply in polite but confident manner.
- Keep cool and show professional maturity in accepting the adverse remarks with a response promising to look into those and take necessary action.

The candidate has the full command over the topic and has conducted the research work with full seriousness are the two principal things the Examiner/s would like to ascertain through the viva-voce. It is, therefore, necessary to address all the queries confidently and politely and convince the examiner/s about the credibility of the whole research that is reported in the thesis.

13.4 Converting an Academic Thesis into Book

It is often possible to bring out a book on the basis of the doctoral thesis for larger dissemination. However, it should not be given as it is to the publisher for printing. Several things are to be done to make it a worthwhile venture. Since the reader is expected to be beyond the researcher quite a few alterations are necessary right from the title to the organisation and presentation of the content. Weigh all the suggestions put forward in this regard by the Publisher based on his commercial experience about such books. For converting your Ph.D. Thesis in a book take the following actions without fail:

- ⇛ Provide a broader title, which can catch attention
- ⇛ Delete some dated material
- ⇛ Update with relevant new material, graphics and recent references
- ⇛ Add name and subject Index at the end
- ⇛ Obtain a Foreword from an expert (optional)
- ⇛ Give the essential technical portion like terms and concepts in the Appendix
- ⇛ Include select References alone
- ⇛ Prepare a blurb (placed on the back cover)
- ⇛ A CD/DVD may be appended if the work could be used for education and training purposes
- ⇛ Explore the possibility of converting it in e-book form for porting on different digital devices

13.5 Writing a Research-Based Report

A research-based consultancy report is to be written differently because the client or reader audience is interested more in suggestions for actions rather than academic elements. In that context the report should have:

- ✓ A fine-tuned Executive Summary (maximum two pages)
- ✓ Terms of Reference of the study either in the beginning or Appendix
- ✓ Emphasis on practical implications
- ✓ Include action plan for implementation
- ✓ Main findings and recommendations may be given in one volume. Data, details of techniques and secondary outputs be given in a separate volume

While presenting the results highlight the options available for the problem with their costs and benefits. Also recommend which option in your judgment would be worth implementing. Avoid talking much about the methodological part in such discussion unless it becomes essential. Even three paragraphs are sufficient in some situations; one articulating the problem, the second talking about options and the third about the recommended option. In such writing the utility of research should get dominance over the theoretical and analytical aspects. Help of a specialist editor for this purpose may be availed of. Many large consultancy organisations hire such services to format the report produced by their researcher or a team of researchers.

13.6 Research Paper Writing

"*Publish or perish rule governs the academic field*"

Most popular way to get recognition to the research work is through publication of the results in the reputed journals devoted to the specialized field. Writing a research paper differs a great deal from that of thesis or report preparation. Here we shall discuss various aspects related to such paper writing and its publication process.

13.6.1 Paper Writing Process

Before commencing the actual writing of a research paper address yourself the following questions:

- Why? [overall objective]
- How? [style of writing]
- What? [content selection]
- So what? [importance of the work]
- To whom? [readership focus]
- Where? [selection of the journal]

By answering the above questions one gets fairly good guidance to proceed further. Answer to the last question leads to the next question, "What are the policy and publication norms of that journal?" In this regard almost all the journals provide "Instructions to Authors", which state the publication policy regarding subject coverage, type of papers (such as theoretical or empirical), length, style for references and submission procedure. A careful study of those instructions is recommended before launching into writing the paper for a journal.

Basically a research paper is expected to follow what is called as IMRAD structure namely, **I**ntroduction, **M**ethod, **R**esults and **D**iscussion. Of course, one has to make a variation to it depending on the subject matter. Given below is a generalised scheme for writing a research paper.

1) Title
2) Author and Affiliation
3) Abstract or Summary
4) Key words or Descriptors
5) Introduction
6) Aim or Objective of the study
7) Literature Review
8) Methodology or Method and Procedure
9) Conduct of the Study
10) Results (Tables, Figures)
11) Discussion
12) Conclusion
13) Acknowledgement (optional)
14) Abbreviations or Glossary of terms (optional)
15) References
16) Appendix

Let us discuss these elements in more details.

Title: It should be catchy, but appropriate for the contents. Again confine it to 12-16 words is a thumb rule. List all possible words that you want in the Title. Prepare their various combinations. Use Thesaurus to select most suitable shade for the core words. Evaluate which combination is the most compact, apt and sounds pleasing. It is advised to decide the Title last along with the Abstract of the paper.

Abstract: Abstract or Summary is supposed to tell about the overall contents. It is expected to be given in maximum 250 words. Generally, it should form a single paragraph, written in the past tense and be self-contained, which means it should be independent of any reference. Writing an Abstract is an art because it has to cover the purpose, method, findings, implications, contribution value, type of work (theoretical, empirical), and conclusion in the given word limit. Some journals prescribe a lengthy Abstract style calling for elaboration on the methodology, type of contribution and usefulness in real life, if applicable.

Key words or Content descriptors: These are used by the Abstracting journals and search engines on the Internet to inform the readers about the coverage of the subject by the paper. They are restricted to 5 to 7 in numbers and suggested to cover: main subject, specific topic, core problem or idea, method, empirical setting, if any. It is suggested to arrange them alphabetically.

Introduction: This very first section of the paper should give a background about the subject and the importance of the problem considered. It is a good practice to provide the plan of the paper in the last paragraph of this section.
Objective: Main problem and its division in sub-questions or hypotheses should be stated precisely in this section.

Literature Review: It should cover only the essential works having immediate bearing on the study.

Methodology: Methods and procedures used for data collection and analysis are to be described in all essential details to give fair idea about the conduct of the study.

Results: Give the tables and figures along with the description of the most essential findings. Never include raw data in results. Do not present same data more than once.

Discussion: Here comprehensive interpretation about the data and results should be given. How the results are validated is to be described.

Conclusion: Describe conclusion about each objective or hypothesis. Present theoretical and practical implications of your findings. Focus on the mechanisms regarding the results came out as they did. Conclusions should give summary, broader implications and future directions.

Acknowledgement: Help received from others in the work and publication could be mentioned here. Extending thanks to the anonymous reviewer/s for suggestions that helped in improving the previous version of the paper is a standard practice. However, this whole section is optional. Similarly the glossary of terms is optional.

References: Follow the instructions given by the journal for giving the references and their citation in the text. Many times paper is returned without undergoing a review, if the prescribed style for this purpose is not followed. It gives an impression that the author is not serious about publication in that journal.

Remark 3: In case of a multi-authored paper quite a few journals, particularly in the medical field insist on a statement about the specific contribution by each author to the research and paper writing. Further, they demand conflict of interest disclosure statement by each author and role of the sponsor, if any.

By and large length of a research paper is prescribed to 5,000 words that include references too. A review paper could be longer in length. Some journals publish matter under technical or research note and a limit of 1,500 to 2,000 words is prescribed for it. That is why it is extremely important to assess the quality of the paper and choose the journal and its appropriate section accordingly. It is suggested to make a list of the major journals in the field of interest and classify them in the top, middle and remainder category. Subject experts and professional library staff can help in this process. Another method is to obtain the *Impact Factor* of the journal from its office. Higher the impact factor means more read and prestigious journal. One can then select the possible journal matching to the quality of the contribution.

It would be prudent to avoid the top or World class journals in the beginning because their expectations are really very high. They are not just satisfied with the reasonable quality of the research paper. They look out for the papers that are path breaking in the field or launching a novel line of inquiry.. They therefore ask the reviewers to evaluate the manuscript from that consideration too. No wonder the rejection rate of such journals exceed even ninety percent.

13.6.2 Select Guidelines

One may go through two or three rounds of revising the draft. At the end one may ask oneself the following:

- What is the new thing being conveyed and is it properly highlighted?
- Is the material relevant for this Section or Sub-Section?
- Can the matter be written differently or presented, say by a Figure?
- Have I become a slave of a particular word or phrase?
- Are all the references cited?
- Are all the instructions of the target journal followed?

Further, one must become one's own critic. Ideally, the draft is to be treated as if it has been received for a critical review. One should be merciless in editing the drafts. No compromise on quality writing and presentation should be made. That is why sufficient time for writing and revising the paper must be given. Sleeping over one's last draft for about two weeks and then reading it afresh for giving the final shape is quite useful in practice.

13.6.3 Publication Process

Quality journals employ *double blind peer review* process for evaluating the submitted paper. For this purpose the author is instructed to write the title of the paper, name and affiliation of the author and address for the correspondence on the first page of the manuscript alone. The title, abstract and the rest of the paper should start from the second page. The first page is removed and identification number is put on the manuscript and it is sent to the reviewer so that author's identity is not revealed. And of course, name of the reviewer/s is not revealed to the author and thereby the double blind review is ensured.

The manuscript so received is examined by the editorial team to judge whether it is worth sending to the reviewer for critical evaluation. If it is found worth so, then it could be sent to one or three or more reviewers simultaneously. Reviewer is usually requested to submit the review report in two to three months. Further, a clear cut decision about the paper namely, *rejects* or *accepts* or *revise* the paper is expected of the reviewer. Possible reasons for the rejection and points for revision are also requested to guide the author.

Report received from the reviewer/s is discussed by the editorial team and the final decision is taken. Accordingly the author is informed. If the revision is desired then the author is informed about the points or aspects for the revision. Moreover the author is generally given a time limit for submitting the revised version beyond which it may not be considered. The revised paper may or may not be sent to the reviewer/s as per the assessment of the editorial team or the reviewer's desire. Accepted paper goes into the publication queue and is finally published in the printed form. This process can take several months. That is why journals usually mention the date of receipt of the original manuscript and date of acceptance for its publication either at the beginning or end of the published paper. Now most of the journals publish their electronic versions very speedily for rapid dissemination. The author may get that particular issue of the journal or reprints or a copy of his paper digitally in the portable document format (pdf) as per the journal policy.

Due to the Internet and e-mail facility this whole process is speeded up to a great extent. Electronic version of the issue is available instantaneously to the subscribers and printed version comes out later. Search engines immediately pick up the paper and inform about its various aspects to those looking out for information on that topic.

Remark 4: It is considered useful to send a reprint or softcopy of the published paper to the known researchers in the field and also to one or two authors whose work has been cited in the paper.

Remark 5: It is clarified that the ISBN (i.e. International Standard Book Number) of a book and the ISSN (i.e. International Standard Serial Number) of a periodical are simply the unique identification numbers to facilitate their commercial transactions. They can be obtained by any publisher (free of cost) and thus have absolutely no relation with the quality of a book or periodical, respectively. Publication of a chapter or paper in such a numbered document does not mean much and should not be considered as an achievement

13.7 Writing a General Article

At times it is useful to write article based on your research for the consumption by the general readers. A professional or trade magazine or even newspapers welcome such a piece depending on the importance of the subject. Writing for such audience needs a different style. Below given are a few guidelines in this regard.

- Give more fancy title
- Provide some highlights in a box form
- Avoid the technical terms and jargons as far as possible or explain them suitably

- Limit the length to say 1,500 to 2,000 words
- Include more practical applications and implications
- Insert interesting but relevant pictures and figures
- Use ‘pyramid’ (particular to general) or ‘inverted pyramid’ style (general to particular) or both for developing the article
- Suggest select reading list and web sites, if the media style permits

13.8 A Challenge of Wider Dissemination of Results

Writing in general is an involved process. It needs significant variation depending on the mode of dissemination. Researchers are however encouraged to master these different styles of writing and presentation because that is the end product, which is evaluated and matters most. That is why the skill in redrafting research writing for a popular magazine, newspaper, blog or making oral presentation is assuming a greater importance. In the Indian context publishing the research findings in the regional or local languages is also expected.

Making available the findings of the research to general public apart from the fellow professionals is the emerging demand and the researcher should develop requisite writing skills to address it satisfactorily.

[Refer Sr. No. 8, 23, 47 and 55 under the Bibliography]

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Chapter 14

Research Ethics

14.1 Ethics

Ethics, as a part of philosophy, has been a subject of study for the past thousands of years. No wonder a vast amount of literature discussing its various theoretical and practical aspects is available. Basically it is a general term for numerous ways of understanding and examining the moral life. For our purpose, we consider ethics as a concern on the proper performance of the research. In particular we expect the following:

- The rules of ethical conduct at each step of the research are to be followed.
- The values of honesty, frankness and personal integrity are to be adopted.
- Ethical responsibilities to the human beings as subjects of research such as their consent, confidentiality and courtesy are to be discharged faithfully. Those should also be extended to the non-human living creatures as far as possible.

There are three major approaches to view ethics. They are described below briefly.

1. *Consequentialist approach:* it maintains that action is morally right or obligatory if it will produce greatest possible balance of good over evil.

2. *Non-Consequentialist or Deontological approach:* contrary to the above view this approach suggests that something may be regarded as morally right even if it does not produce the greatest balance of good (I. Kant's position).
3. *Virtue ethics theory approach:* it gives more importance to the moral character of the decision-makers and not the consequence of their actions i.e. agent-centred rather than act-centred approach.

We shall discuss ethical perspectives as applied to each step of the research process in the rest of the Chapter.

14.2 Ethics in the Literature Review

Ethics can be violated even while selecting and reviewing the literature. For instance some references may not be considered or a review of some works may be presented with prejudice for some reasons. The actions given below are therefore recommended to avoid such violations in practice.

- To perform wider search to locate the works related to the research theme available in the print, microfilm and digital or electronic form.
- To acknowledge all the previous contributions as far as possible, irrespective of the author or place of origin.
- To evaluate the works by others in proper perspective.
- To present the review in an objective and balanced manner.
- To avoid dropping any serious research work of others on flimsy grounds.

14.3 Ethics in the Research Methodology

All the possible candidate approaches for research methodology that could be employed must be described. Selection of a particular methodology to conduct the research should be done after fairly weighing those options. The following points may be noted in this regard:

- ☐ To avoid selecting data type and methodology that is likely to support one's pet theory.
- ☐ To provide all the methodology details for anyone to replicate the study, in case desired.
- ☐ To stick to the norms and standards adopted for the study (e.g. not changing the pre-decided level of significance in statistical tests)
- ☐ To record and report the results faithfully (e.g. avoiding one-sided view)
- ☐ To select appropriate methodology for validation of the results.

14.4 Ethics in Surveys

Many research projects involve human being as the subject of study. They are subjected to some conditions known as *treatment* like physical stress, medication and mental tests or conditioning, which can cause them some discomfort, disorientation or disability in the short or long run. That is why utmost care is needed in treating them so that they revert to their normalcy at the earliest. The issues involved are:

a) **Harm** - participants surveyed should not be harmed, physically or psychologically except for a minimum period as per the requirement of the study.

b) **Consent** - participants be given adequate information about the study aim before asking their consent to participate in the study.

c) **Deception** - deceiving the participants to obtain the replies be avoided as far as possible.

d) **Confidentiality** - promise to not reveal the identity of the respondents must be kept at any cost.

e) **Privacy** - participants should not be forced to part with sensitive personal information.

Let us consider some of these aspects in greater details.

14.4.1 Obtaining Consent of the Participants

Actions with regard to the following questions must be planned in advance:

- How do we go about getting the participants' consent?
- How do we demonstrate that the participants have given their informed consent i.e. they fully know the implications?
- How will participant's confidentiality and anonymity be maintained?
- How personal data will be processed?
- How the participants will have access to the results of our study, if they desire?

The concept of the *informed consent* is quite important in real life situation. Formally it means participants are informed and respected. This is done by:

- ✓ Providing substantial understanding i.e. all important facets of the study are explained to them.
- ✓ Controlling influences i.e. all influences that can obstruct independent thinking are blocked.
- ✓ Coercion Absence i.e. irresistible threats are avoided.
- ✓ Manipulation Avoidance i.e. subtle hints for the desired response are not offered.
- ✓ Material information provision i.e. documents explaining issues that can affect the respondent are given to her/him freely.
- ✓ Effective communication i.e. full mutual confidence is established so that participants respond without a reservation.

Written consent by the participants in the research experiment or clinical trial is ideal, but sometimes verbal one is enough. Whose consent is to be obtained must also be determined carefully. For example, consent given by the head of the household is adequate or in addition that of the specific member of his household who is the participant is to be obtained. If the participants do not understand the language then an interpreted version of the consent form or its recording in audio-visual form could be considered. Taking a signature on the consent sheet of a witness in whom the participants trust is another solution.

For obtaining the consent a procedure on the following lines is suggested:

1) Introduce yourself (name and institution).
2) Briefly describe the survey topic.
3) Inform about the geographic area or sector covered.
4) Tell who the sponsor is, if any.
5) Describe the purpose of research.
6) Give a fairly accurate estimate about time the participant would be engaged.

7) Promise anonymity and confidentiality.
8) Tell the participants that the participation is voluntary.
9) Inform that a question-nonresponse is acceptable.
10) Ask permission to begin the interview or administer the questionnaire and also about recording it, if that has been accepted in advance.

In several cases the consent obtaining document can run into a few pages. Figure 14.1 illustrates a summary of the consent document that is to be signed and retained by the respective participant and researcher, if not the whole document.

Sample Consent Form

Title of Project:	**Y/N**
I have read and understood the information sheet	
I agree to participate in this research	
I understand and agree that the research may be recorded	
I understand the research may be disseminated in different forms and what I say may be quoted	
I agree for the said dissemination of my quotation as long as what I say is anonymised	
I understand I can withdraw my consent and participation from the research at any time; and from any specific aspect without giving a reason	

Name of Research Participant Signature Date

Name of Researcher Signature Date
Researcher's Contact Details:

Figure 14.1: A Consent Summary Sheet

14.4.2 Confidentiality

Confidentiality about storage and processing of the collected data needs careful consideration. Participants should be informed how the confidentiality of the information obtained from them is proposed to be maintained. Aspects to be covered are:

- Blocking the release of the recorded data to anyone or agency is to be planned.
- Method of secure storage and handling paper records is to be designed.
- Method of electronic data storage and transmission that is, decision like data encryption method and network security is to be taken in advance.
- Methods of statistical disclosure are to be decided.
- Description of the method for the disposal of data upon terminal of the study is to be prepared.
- Penalties for breaches are to be spelled out.

14.4.3 Privacy

Privacy is usually viewed more important than confidentiality by the participants. So the response received from any participant, as stated below, must be accepted without questioning:

- Refusal to participate
- Refusal to answer any specific question or section of the questionnaire
- Desire to withdraw from the study at any stage
- Conducting interview at a place suggested by the participant (to the extent feasible)

Further do the following in this regard:

- ✓ Inform the participants about their rights.

- ✓ Obtain permission to interview or observe them.
- ✓ Schedule the interview say in person or by telephone, well in advance.
- ✓ Limit the participation time.
- ✓ Avoid the observation of private behavior, to the extent study permits.

14.4.4 Data Masking

Data processing and presentation of the information so generated must be done in such a way that identity of no participant is ever revealed. Some of the standard schemes for this purpose are:

- ❖ *Tabulation* - information is presented in a total table form alone.
- ❖ *Aggregation* - information is provided in certain minimum number of units and not below it.
- ❖ *Suppression* - some information is not presented if that helps maintaining the anonymity of the participant.
- ❖ *Random rounding* - rounding off the data cells is done randomly to secure anonymity.
- ❖ *Confidentiality edit* - altering values for small sample say by clubbing the categories.
- ❖ *Tables of magnitude data* - avoiding the display of sensitive data by suitable means.

14.4.5 Debriefing the Participants

In some studies informing the participants about the purpose or any other related aspect of the study in the beginning can alter their attitude or behavior and thereby defeat the very purpose of the study. So they may not be briefed or informed completely at the commencing stage of the study. However, if the participants are intentionally kept in dark as stated above or are accidently deceived, below given actions are ethically **essential** in due course:

- Explanation for any deception is to be provided at the earliest.
- Description of complete purpose of the study with salient features is to be given at the earliest.
- Post-study sharing of results is to be done, if any participant desires.
- Post-study follow up medical or psychological attention, if needed, is to be given free.

14.5 Research Misconduct

Commonly observed elements of the research misconduct are:

⌘ **Fabrication** – doctoring the laboratory observations, field data and results and reporting them as true outcome.
⌘ **Falsification** – manipulating research process to suit the objective.
⌘ **Plagiarism** – appropriating other person's ideas, results or words without giving due credit.

Not disclosing conflict of interest, ignoring outliers in data set without declaring, not informing about missing data and redundant publication are some of the other major misconducts in the research.

With the proliferation of information available in the digital form on numerous web sites and access to computer and the Internet the tendency of copy-pasting of the material has greatly facilitated. This has increased plagiarism manifold at the research level too. Let us, therefore, turn to this disturbing factor in more details.

14.6 Plagiarism

Plagiarism covers the following and much more:

- turning in someone else's work as one's own
- copying words or ideas from someone else (not putting in " ") and without giving credit
- giving incorrect information about the source of a quotation deliberately
- changing words but copying the sentence structure of a source without giving credit
- copying so many words or ideas from a source that it makes up the majority of your work, whether you give credit or not

The web site www.plagiarism.org is the source of the above material and this web site provides quite useful guidelines in this regard. Periodic visit to this web site can update oneself about the latest thinking on plagiarism.

Heavy punishments for plagiarism are in place now all over the World. They are like:

- ➢ ***Academic Punishments:*** expulsion from the course and failure.
- ➢ ***Institutional Punishments:*** blocking the promotion or dismissal.

- ***Legal Punishments:*** substantial fine and/or imprisonment.

It must be understood that the plagiarism does not help in any manner and should be avoided to develop a good research career.

14.7 Ethics in the Research Publication

Due to strong pressure to have a number of research-based publications to one's credit, particularly in the academic field, researchers are found taking recourse to various unethical practices. They are like:

1. Submitting the same paper to different journals without informing the editors.
2. Not informing a collaborator of the intent to file a patent in order to make sure that he or she is the sole inventor.
3. Offering "Gift Authorship" means including name of a non-contributing person for some gain or resorting to "Ghost Authorship" means not including a name of the person though he had contributed significantly to the work.
4. Dropping outliers from a data set without discussing the reasons for it in the paper.
5. Failing to keep research records in proper and truthful manner.
6. Not maintaining research data for a reasonable period of time, say for three years.
7. Using an inappropriate statistical technique in order to enhance the significance of the research.
8. Conducting a review of the literature that fails to

acknowledge the contributions by other people in the field or relevant prior works.

9. Bypassing the peer review process and announcing the results through a press conference without giving experts adequate information to review the work.
10. Overstating the contribution or usefulness of the research in order to convince reviewers to accept the paper or proposal, respectively.

14.8 The Reviewer's Ethics

In the research publication process the reviewer plays a crucial part in evaluating the manuscript forwarded by the journal for possible publication. The reviewer should act ethically as follows:

- Avoid making derogatory comments and personal attacks in his review report about the submitted paper or document.
- Not rejecting a manuscript for publication without even reading it.
- Not resort to sabotaging someone's work.
- Not using the submitted manuscript for own publication or use it for own interest in some other way depriving the original author her/his due credit.
- Not discussing with colleagues or students the confidential data from a paper received for reviewing.

14.9 Ethics for the Research Guide or Supervisor

Role of a Guide or Supervisor is crucial in the research process leading to the research degree like M.Phil. or Ph.D. for his/her student. Inculcating high professional and ethical values in the students is expected of him/her. Functioning of the research supervisor should be above the board because they serve as the role model for the students who try to emulate their practices when they become research guide or supervisor in future. It is therefore very important that Guides should avoid the following acts:

- Giving the same research project to two research students in order to see who can do it the fastest.
- Insisting for authorship in every publication even if no substantial contribution is made.
- Burdening, neglecting, or exploiting doctoral and other students.
- Following outdated research practices.
- Providing a student a better guidance for monetary or other compensation.

14.10 Guard against Biases

Though single track devotion to the research is welcome it often happens that a researcher engrossed in her/his work introduces bias inadvertently. It could be in anyone or more of the following types:

- ***Theory and knowledge bias*** – to evade accepting new proven ideas.
- ***Advocacy bias*** – claiming one's work as the best without limitations. Use of the tools familiar to one is only promoted all the time for all problems.
- ***Normative bias*** – goal value attached to the results (it ought

to be like that!).

- ***Disciplinary bias*** – multi-dimensional problem is viewed from one's discipline alone. Limitations of the disciplinary tools are often glossed over.
- ***Omnicompetence bias*** – posing as an expert on any issue becomes the tendency.
- ***Psychological bias*** – tilting the experiment and interpretation according to the psychological make-up or some pre-conceived notion.
- ***Values and bias*** – presenting results without cross-checking and filtering possible bias introduced due to personal values.

14.11 Sponsored Research and Ethics

Considerable amount of research both in the academic and other fields is sponsored by different agencies operating at the local, state, national or even international level. Sponsors could be from the public sector, private sector firms and voluntary sector institutions. If the researcher is employed and gets a sponsored research project then he should get clarified roles, rights and obligations of sponsor, employer and researcher himself right in the beginning.

Obligations of researcher to sponsor and employer are:

- ❖ he/she should be honest about the qualifications and expertise.
- ❖ he/she should inform about the advantages and disadvantages of the methods and allied aspects.
- ❖ he/she should maintain discretion with confidential information provided by sponsors and employers.

One must be aware that more often than not the funding steers the conduct of the study and results. Only sponsored objectives are researched and other fall outs are overlooked, howsoever beneficial they may be (e.g. disease prevention will be overlooked, if developing a new drug is the objective). Pressure is put to justify the perceived or desired objective (e.g. building a road or rail link). Specifically the sponsor may put pressure on the researcher for the following and those should not be accepted by the researcher on the professional ethics ground:

- Violating participant's confidentiality
- Changing data to meet desired objective
- Modifying presentation and interpretation
- Omitting undesirable sections of data analysis and conclusions
- Making recommendations beyond the scope of the data collected

The following conditions are ethically acceptable:

§ Sponsor nondisclosure – name of the sponsor should not be disclosed to the participants.
§ Purpose nondisclosure – aim of the study need not be informed so that competitors do not get signals.
§ Findings nondisclosure – research results are exclusive property of the sponsor.

14.12 Summary Principles

In sum the ethical considerations in research can be stated as:

- ✓ ***Truthfulness*** (study purpose is not deliberately misrepresented, subjects are informed about the possible dangers, results are not inflated)
- ✓ ***Thoroughness*** (key concepts are defined, sampling is appropriate, limitations of the research design are identified)
- ✓ ***Objectivity*** (instruments are not loaded, only justified techniques are used, interpretation of results is based on data alone)
- ✓ ***Relevance*** (study serves some useful purpose, efforts and resources used are justified, no harmful purpose is to be served)

14.13 Ethical Dilemma and Resolution

In real life several problematic situations are faced by a researcher and action to address those is whether ethically correct or not is difficult to assess a priori. For instance,

- Action may be legal but unethical (e.g. giving information about data disclosure in very fine print on an application form, which can escape the attention of the reader)
- Action may be illegal but ethical (e.g. a book banned in a country could be used for academic research purpose if the subject matter of research makes it absolutely essential)
- Some participants may not want to have their identity remain confidential so that they want their views be presented with their name (They must be warned about the possible harm that could cause to them when reported and may infringe on the rights of the other participants)

A new dimension is now added to this issue as conducting e-research or online research or cyber-research in general is gaining popularity, but norms for ethical behaviour for the same are yet to be developed and tested adequately.

Interpreting actions taken in such situations needs careful attention. Some of the useful strategies to resolve such a dilemma are to consider the following questions; their answers would generally show the way out:

- What is the problem or issue?
- What is the relevant information?
- What are the different options?
- How do ethical codes or policies as well as legal rules apply to these different options?
- Are there any people who can offer ethical advice?
- Which choice could stand up to further publicity and scrutiny?
- Which choice could you not live with?
- Think of the wisest person you know. What would he/she do in this situation?
- Which choice would be the most just, fair, or responsible?
- Which choice will probably have the best overall consequences?

Considerable debate and discussion is constantly going on about research ethics at the academic and professional levels in most of the subjects. The following websites may be referred in this context to know some of the latest views and thinking:

- www.apa.org/ethics
- www.asanet.org

- www.aaanet.org
- www.aera.net
- www.ana.org
- www.cre.gu.se
- www.epic.org
- www.ethics.org
- www.primr.org/
- www.carso.org
- www.und.edu/WAPOR
- www.esomar.nl

14.14 Grey Areas

Besides the ethical dilemmas discussed above there are a few issues related to the field study in particular, that are found difficult to resolve. For example,

- ☐ Interviewee sometimes does not maintain the confidentiality.
- ☐ Deception is sometimes essential.
- ☐ Debriefing after the study can prove harmful to some participants.
- ☐ Disclosure of collected data can sometimes be useful in the larger interest of the society.
- ☐ Conduct of the study can send wrong signals.

[Refer Sr. No. 19, 25, 26 and 54 under the Bibliography]

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Chapter 15

Good Research

15.1 Evaluation of Good Research

The Doctoral Thesis is evaluated by a set of external examiners to judge whether the reported research work is adequate both in quantity and quality for the award of the Ph.D. or equivalent research degree. In case the thesis is found suitable it is followed by the viva-voce i.e. oral presentation by the researcher and his or her interaction with the expert examiner. Its main purpose is to ascertain the researcher's efforts and command over the selected topic. On the basis of the report covering the thesis evaluation and the viva-voce performance the said degree is declared awarded after completing the related administrative formalities. Since the doctoral degree is a research degree there is no grading or marking done by the awarding University or Institution as is done for a normal academic degree (e.g. B.A., B.Sc. and B.Com.).

In India, the degrees of Doctor of Philosophy awarded by the universities and research institutions that are recognised by the University Grants Commission are treated as equal for instance. Presumption is that the researcher would have gained sufficient insight into the process of research during the study for his/her doctoral degree and that experience would help him/her to produce research work of higher quality in future. In that sense Ph.D. degree is considered as an acknowledgement of the researcher's preparedness to take on new research challenge. Continuation of research, thus expected, may not happen in all the cases because the motive to obtain this degree varies from person to person. That is normal however.

It is generally expected that the research at the doctoral level has to be of reasonably good standard. In many instances the quality of research is judged by the tradition and name of the institute where the research was conducted. However, in the course of time the research quality norms and standards of the institutes undergo changes making such judgment off the mark in the present context. Moreover quality research can take place at newly established institutes too. Apart from the equipment and other infrastructure facilities the motivated team of researchers and supervisors makes a difference.

Defining good research is thus difficult. Subject specific considerations and institutional norms do play a part in its conceptualisation. Some of those norms do change with time. Still, certain features can be identified as contributing to the good or quality research. Discussion of such elements in the academic and other contexts is the aim of this Chapter.

15.2 Overall Features

In general the following features of research are considered as contributing to the good research:

- Research is done objectively and not to support some ideology or please the funding agency.
- Research is not done because it is expedient that is, convenience of the researcher is the guiding factor.

- Research results provide an action plan to the extent possible so that the utility of the research is established. In this context research ending in construction of a guiding unit like index, indicator, coefficient and quotient is considered a significant contribution.

- Research results are not overtaken by the circumstances, which means research is completed in reasonable amount of time to remain valid and applicable.

15.3 Quality Elements for the Academic Research

Presence of the following elements in the conduct of research and written thesis can be taken as characterising a good research.

15.3.1 Research Process

The research process should reflect the following aspects:

- High ethical standards are adopted at every stage of the research.
- Results are validated using standard practices.
- Interpretations are within the data coverage.
- All the research objectives are adequately addressed.
- New insights are revealed.

15.3.2 Research Writing

- Research process is described in full details.
- Copy of survey instrument/s is provided.

- More than two third (i.e. 67%) of the thesis is the author's own original material.
- Research limitations are stated.
- Organisation of the work and writing is convincing about the professional outlook.
- References are:
  - complete, recent and standard
  - following a standard style (even for e-references)
  - properly cited in the text

15.3.3 Error Free

Research should be free from the following types of errors:

- *Over-generalisation:* prediction of general pattern of say, behaviour from a very few observations.
- *Selective observations:* observing the things that are in line with the researcher's view.
- *Illogical reasoning:* conclusions based on invalid assumptions.
- *Resistance to change:* not changing the view despite evidence.

15.4 Citation Score

That research is considered good or useful which is cited by researchers other than the author as reference in their own work. For this purpose a number of Citation Indexes are available. A citation index of a research paper or work expresses the number of times it is referred to by other researchers in referred journals. It is also a measure of validity of its contents. Though there are some drawbacks in using any citation index or score for evaluating the research it continues to remain one important measure in this regard in the academic field.

One of the popular citation indexes is called *h-index* that was suggested by Jorge E. Hirsch in the context of theoretical physics. A researcher with an index of *h* has published *h* papers each of which has been cited in papers by other at least *h* times. Thus, the *h*-index reflects both the number of publications and the number of citations per publication. h-Index varies with the field; it generally rises with the 'academic age' of the researcher and can be used to compare productivity of the contemporary researchers in the same field (not suitable for historical comparison). Obviously the researchers with high h-index value indicate usefulness of their works. This index is further refined to *g-index* and *a-index* for better evaluation.

15.5 Quality Assessment by Journals

It is interesting to note that the World class journals have their own standard to judge the research quality. For them accuracy and contribution to knowledge by the research paper is not enough; they expect the paper should be path-breaking in nature giving new direction to the subject or branch of knowledge. No wonder their rejection rate exceeds even 90 percent at times. For this purpose they occasionally take opinion from more than three experts.

The quality of a journal in which the paper is published also plays a very important part with regard to evaluation of research contribution. A measure called the "Impact Factor" (I.F.) is employed to assess the quality of a journal. It is a measure reflecting the average number of citations to recent articles published in a given journal. Journals with higher impact factor are deemed to be more important than those with lower ones. The I.F. was devised by Eugene Garfield, the founder of the Institute for Scientific Information (ISI), now part of Thomson Reuters. Impact factor is calculated yearly for each journal and is indexed in Thomson Reuters *Journal Citation Reports.*

There is an elaborate method to compute the impact factor of a journal (Refer Appendix to this Chapter for its computation). A research library or the journal office may be contacted to obtain the Impact Factor of the corresponding journal for the past years. Obviously publication in the journals with higher impact factor is taken as reflecting higher quality of the research paper. Generally the journals with the I.F. exceeding five is considered to be of really top class quality. Next best is the class of journals having the I.F. between three and five followed by those having the I.F. between one and three and lastly those having it below the value one. Publication of even a small technical note or short communication in the high impact factor journal is significant and should be attempted by the new researchers to gain confidence.

15.6 Good Research in Business Domain

15.6.1 Commercial World

Research work done for commercial or business organisations is considered good if say it results in increasing the profit or market share of the firm in real life. That means the quality of research is assessed on the basis of commercial parameters rather than the academic values. That is why the research that looks good in the laboratory may not always prove useful in practice due to such reasons. In that case research is ignored despite its non-commercial benefits. In other words, research that is judged as good in scientific or academic term turns out to be secondary from the utility point of view. In several instances, the research that gives ordinary outcome, but completed in the given time limit is considered good by the companies for its opportunistic use.

15.6.2 Industrial Houses

Quite a few industrial houses treat research as useful if that can be patented. However obtaining a patent is a long drawn and uncertain process. It involves considerable legal documentation too.

It often happens that seemingly good research fails to get patent, whereas, very mundane ideas get patented, which may however not generate any revenue!

15.7 Scaling the Higher Peaks

It is clear that barring the exceptions it is difficult to produce research of highest quality in the very first attempt whether in academics or business world. Researchers should learn from the experience and go on raising the quality of their research gradually. Analogy from the activity of mountaineering is to be drawn in this context.

Patience and persistent efforts hold the key. Building solid foundation and learning good practices of research must therefore be given due attention while working for the doctoral degree. It is an investment that would provide life-long benefits in numerous ways to the researcher. Tendency to employ shortcuts should be curbed for the long term advantage, especially if one is aspiring to pursue a research career.

Appendix

Calculations of the Impact Factor for a given journal say 'J' for the year 2014:

A = the number of times articles published in J in 2012 and 2013 were cited by the indexed journals during 2014.
B = the total number of "citable items" published by the journal J in 2012 and 2013.
("Citable items" are usually articles, reviews, proceedings, or notes; not the editorials or Letters-to-the-Editor)

So the Impact Factor for 2014 for the journal J is given by ***A/B***.

Note that 2014 impact factors are actually published in 2015; they cannot be calculated until all of the 2014 publications have been processed by the indexing agency.

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Chapter 16

Research Skills

16.1 Basic Skills

The researcher is expected to be well aware of the techniques and best practices of his/her core subject. Moreover, for a researcher, irrespective of the area of study, imbibing the following fundamental skills and attitude is considered as essential:

¶ *Tenacity:* Occupying one place to do the calculations or writing.
¶ *Continuous Efforts:* Thinking and working on a problem constantly.
¶ *Reading and Writing:* Keeping up-to-date by reading and tracking the ongoing developments on the selected topic, preparing notes about them and periodically compiling them.
¶ *Participation in Discussions:* Engaging in interactions through various media and networking with peers and others to learn and respond professionally
¶ *Computer Fluency:* Mastering the requisite software and exploring the usage.
¶ *Patience:* Never losing heart; trying again and again.
¶ *Language Mastery:* Constantly reading and learning the skill of writing.
¶ *Single Mindedness:* Not indulging in side activities that divert the attention from the research objective such as preparing for the competitive examinations.

16.2 Specific Skills

16.2.1 Information Searching

It is necessary to develop skill to understand,

What type of information is needed? For example, from among the most current or historical and archival types.

What sources are available? For example, print, non-print (like microfilms) and digital covering the books, journals, theses, databases and statistics.

How to search? For example, searching the library catalogue, web-based Open Public Access Catalogue (OPAC), electronic journals, databases and web sites.

16.2.2 Information Evaluating

It is necessary to develop skill for,

Checking the source – is it reliable? From a government or university department, for instance.

Level of information – is it an academic article, a news item or written for the general public?

How up to date is the information? It should be providing the latest status for most of the research.

Is it biased? For example, from a newspaper, political organisation, company or pressure group.

16.2.3 Managing Information

It is necessary to develop skill for,

Proper recording – For example noting the complete imprint information about print references and the web site (URL-Uniform Resource Location) addresses along with the date of browsing or downloading the information.

16.2.4 Writing Professionally

It is necessary to:

Master different writing styles - as per the selected publication outlet like thesis or dissertation, research paper and technical report.

16.2.5 Grounding in the Research Ethics

It is necessary to know the basic principles of the research ethics like to

- ✓ Give credit to other people's work fully by providing complete references.
- ✓ Avoid plagiarism – any quotation should be clearly shown and fully referenced.
- ✓ Respect confidentiality if information is acquired from private sources.
- ✓ Provide a balanced interpretation of other's work and also of the own research findings.

16.3 Statistical Software Usage Skill

A large number of computer software packages for statistical analysis are available. Some of them are proprietary or commercial while quite a few software products available in the public domain and as open source software. For a research career in any field a fairly good command over at least one such package is necessary.

Equally important is to master the subject specific computer software tool like that of geographic information system (GIS) for the research in the subjects of geography, geology and space science and that of social network analysis for the media studies and political science research.

Learning their operations can usually take two to three weeks, but, understanding basic assumptions of any chosen method and interpretation of results would take longer. Best way to learn them is to construct a dummy data set and experiment.

16.4 Research Skill Development

A researcher should do self-evaluation in respect of the above skills. That would help identifying suitable strategies to acquire the needed skills. Fortunately most of the research skills outlined above can be developed through suitable training and practice.

Special efforts should be taken to develop a skill for rapid reading that is, to understand the core idea or approach presented in any document in the first fast swipe to save on time. The identified portion could be read leisurely to get its full import later.

To develop a good presentation skill both oral and writing skill is absolutely necessary for a researcher. This can be learned by observing the experts addressing seminars and conferences and also reflecting on their research writings of varied type.

It is of course worth reminding that a basic to all such effort is to develop the skill of *time management*. Drawing a schedule of research and allied activities in tandem with other things is the first step. Utmost care must be taken to stick to it by eliminating or curbing what is called as the time-stealing activities is the next step. This skill development is a part of the self-discipline and is honed by sincere efforts and stretching oneself to the maximum extent. It is possible to do so can be stated from our experience.

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Chapter 17

Management of Research

17.1 Research Complexity

Till the early part of the twentieth century it was possible for a individual researcher to conduct professional research in more than one subject with equal proficiency. However, such a thing is rare now. Research in most of the disciplines has become a complex activity in the contemporary era. There are two principal dimensions to it:

1) Explosion or huge proliferation of knowledge in every subject and its ever increasing sub-subjects, and

2) Enormous cost of research, for example in the frontier areas of research in subjects like physics and genome mapping.

Under such circumstances it is almost impossible for one person to do quality research beyond her/his specialised topic or sub-subject on a sustained basis. To keep track of the research reported even in one narrow area has become extremely difficult. For instance, remaining up-to-date by referring a large number of print and online journals and other related material on the topic demands considerable time and efforts.

Conducting research in some areas need expensive laboratory facilities, super-computational power or sizeable manpower for carrying out field surveys. That is beyond the means of any individual. By contrast the equipment used for the experiments by C.V. Raman that resulted in his winning the Nobel Prize for

Physics in 1930 were hardly worth a few thousand rupees. Need to handle the large-scale research activity in professional manner is now a necessity. This was well recognised by T.E. Edison, the famous American inventor quite early. Meaningful research would require a variety of equipment and instruments, expert human resources and support infrastructure was envisaged by him. He, therefore, considered research as an industry in itself that should be managed efficiently and also self-sufficient to sustain in the long run. That concept became popular and several top class research institutions in United States of America (U.S.A.) like Bell Laboratories, IBM Research Centers and several others structured themselves accordingly. Thanks to that process prominent researchers and their path breaking research in many fields emerged continuously. No wonder U.S.A. became a World leader in the field of research in short time.

17.2 Human Resource Management

One of the key areas of research management is to handle the manpower prudently. Highly qualified professionals are involved in research activity and they are quite sensitive about certain issues say about their working style and habits. So any decision about their work supervision, evaluation and compensation is to be taken keeping in view the long term implications. They are basically creative and sensitive persons who dislike bureaucratic work environment that depends on lot of paperwork and playing with the words. Giving priority to their individual grievances and treating them softly is essential. In that context the management should show reasonable flexibility and openness. A major reason for several cases of suicide by the scientists working in the public sector organisations in our country is found to be the harsh treatment they received by the office system that sticks to the rigid rules and procedures alone. Research management should be alive to this reality and adopt an approach to handle the problems of research staff in time and amicable manner.

Further, providing information about the latest development in the respective field of a researcher through a well-developed library and information service should be in place. Such a service should supply precise and authentic information in a concise form so as to relieve the researcher of the information overload.

A fair system to nominate the researchers to different seminars, conferences and workshops in and outside the country should be established. Its selection norms and conditions should be brought to the notice of everybody and no deviation from those to be made as far as possible.

17.3 Research Team Management

A large size research project is usually managed by breaking it in several tasks. Each task is assigned to a separate research team for in-depth analysis. Such team is led by a designated team leader. Selection of team leader is to be done judiciously. Besides his or her research ability, the quality of keeping all his/her team members together and delivering the output as per the project schedule must be considered. Tendencies like researchers trying to outsmart their team members or engaging in research, which may not be connected with the project on hand are to be controlled tactfully is also expected of a team leader.

To build trust, responsibility and complementarity is the key for the team research success. In this regard a training programme incorporating mentorship, communication and other soft skills be designed and delivered to the likely future research team leaders.

17.4 Research Manager

Who should head the Research Division of an organisation remains an open question. One school of thought is that a senior and experienced researcher in the organisation should be given the charge of managing the Research Division or Section. Other view is that a person having a good educational qualification in management and professional work experience should be assigned this job. However, examples are available which show that researcher-manager remains obsessed with some views or petty things due to which organisation suffers; on the other hand qualified manager failing to establish suitable communication or rapport with the researchers resulting in non-deliverance is reported in many instances.

Management of research as a subject needs a fairly detailed attention in the management courses. Moreover special training programmes should be designed to train the aspiring research mangers. Research in this area should also receive attention because it can help promoting and managing research systematically.

17.5 Research Management Aspects

Research management should prominently include the following:

† To assemble well qualified and experienced researchers suitable for the task or project on hand.
† To form requisite research teams balancing youth and

experience.

- To allocate financial budget and other facilities according to the need that is assessed in consultation with the researchers.
- To provide adequate infrastructure facilities.
- To deploy trained staff to maintain the instruments or outsource that task to ensure proper working of the systems all the time.
- To establish a grievance addressing system that settles the issues timely adopting flexible approach to the extent possible.

17.6 Research Management Career

Apart from gaining subject research expertise a researcher should plan his career to become research manager in future. This is suggested in the light of the fact that sustaining creativity in a latter part of the career is not easy for a large number of researchers and they cannot advance much in their respective organisation. Having acquired formal qualification or training and developing managerial capabilities would certainly help in those situations.

Such qualified research managers can run independent research-based consulting firm successfully as they are exposed to variety of research management problems and tricky situations. In the fast changing world researchers should consider such an alternative and prepare systematically for it.

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Chapter 18

Research Experience

18.1 How to Begin?

In several institutions course work on research methodology and associated examination together with delivery of a few seminars are prescribed conditions for the candidate interested in pursuing the doctoral research. This preparatory system is quite effective and should be implemented by other institutes too. However, there is no prescribed syllabus for the ultimate doctoral thesis preparation or examination. Those starting on the research path thus often find it difficult to move ahead. Selection of the suitable topic, the very first step, is the main hurdle they face. Often they find that some topics are too wide in scope, whereas, some are only one research paper length in coverage.

Guidance of an experienced person proves critical at this stage. He or she can assess the potential of the proposed topic and its adequate development to meet the standard of the doctoral degree thesis. Sometimes an academic Guide may suggest some part of his/her research programme to the student as the topic to pursue further. In any case, the research student should read and reflect a lot on the topics under consideration. Further, preparing draft proposals and discussing those with experts help significantly in organising one's thoughts. A Guide prefers such a pains taking student.

18.2 Systematic Search

There is no substitute to the extensive use of the research library by the researcher. For such reference work subject special as well as major libraries in other geographical regions should be visited. Proper notes must be maintained about the documents referred and own observations on their content may also be prepared for future use. This is to be complemented now by browsing suitable web sites and electronic databases of journals and other information that is on the Internet. One should obtain necessary training and guidance from the library and information science professionals or senior researchers for this purpose.

It is reminded that information on the Internet and web sites is not to be assumed as the complete information world. Moreover, information there is not necessarily authentic or stable because it can be altered without intimation. That is why date of browsing and the address of the website (URL) must be noted along with the downloaded information and should be cross checked as far as possible.

18.3 Establishing Network

Collection of information about the prominent learned societies or professional associations dealing with the selected topic or subject proves useful. Taking out the membership of some of those is recommended. Their newsletter and web site must be seriously read to get updates in the field. Sending occasionally suitable comments or observations on such material shows one's interest in the subject to the wider research community. That helps in the long run. Keeping track of the forthcoming conferences and seminars covering the topic furthers learning about new works, evolving ideas and even novel terms and style of giving title to the research paper.

Equally important aspect is to know the experts and other researchers working actively in the area of one's interest. Contacting them say by e-mail and obtaining a complete list of their works is a good strategy. They may be requested to send a few papers out of that list. Acknowledging their receipt should be done without fail. This is a part of what is called as 'net etiquette'. Many researchers maintain their individual web sites or run their blogs through which such interaction can take place. After reading those papers asking the doubts or sending some observations in due course is expected. Expert researchers usually respond even though questions may be elementary for them. Some Experts may suggest additional references and some of those could be from non-English sources. Interaction with such knowledgeable persons can provide valuable insights for one's research problem. Exchange of ideas plays very important part in the research. It is known as "Invisible College of learning" in research parlance. Even in older days of postal or p-mail sharing of pre-print of papers, letters and drafts among researchers was a standard practice. The Internet is greatly facilitating this process.

Remark: In this context it would be interesting to know that the author has jointly published eight research papers with Dr. I. M. Stancu-Minasian former Faculty at the Economic Cybernetics Department, Academy of Economic Studies, Bucharest, Romania in the days when postal (air) mail turned round time for the correspondence was about six to eight weeks. We have yet to meet in person!

Establishing and maintaining such a network by a researcher is quite useful. It could also cover research Guide, colleagues, local and distant co-researchers, journal editors, publishers and library staff. It is absolutely necessary to pay healthy respect to their respective abilities and approach them with humble learning attitude even in correspondence or personal meeting. This generally proves gainful, particularly for the young researchers.

18.4 Work Organisation

Research is a creative activity that is going on constantly in the mind of a researcher. That is why a significant idea, breakthrough or even appropriate word can strike any time, which may be lost if not recorded soon. For this purpose carrying a small pad or notebook all the time is suggested.

It is recommended to draw a time schedule along with the research proposal for own guidance. Estimated time for each task of the research process should be marked on a calendar accordingly. That should be consulted periodically to notice the pace of progress and take corrective action when considered necessary. Not to deviate from the research plan and set schedule should be the policy. Time bound completion of the research is greatly facilitated by this self-imposed monitoring system.

Writing weekly 'research memo' is a good practice. That means every Saturday evening recording the developments that took place in that week pertaining to the research like visit to a library, reading a book, making summary of two research papers or discussion on survey aspects with Guide. It would be ideal if this can be done every evening. Reading of the memos from time to time builds the pressure of its own to allocate adequate time for the planned research tasks. These memos do prove useful for verifying some events or details while writing the thesis.

Preparing a draft of the completed research activity at the earliest is suggested. Converting that into a draft Chapter of the thesis and obtaining the comments of the Guide or Expert saves time later is the experience. Revising those drafts as and when time permits, should also be on the agenda of the researcher.

18.5 Generalisation and Validation

Overgeneralisation means going beyond the data in extending the results is a commonly observed weakness in the research. For instance data collected for the past twenty years should not be used for projecting beyond three to five years in future. In other words data limits should always be examined while generalising the results.

Special attention should be paid to the validation of the research results. More often than not this part of the research activity is found weak. For example, non-validation for causal relationship is seen in several studies (statistical testing deals only with chance effects).

Quite a few methods are available for the research validation as discussed in Chapter 12. Appropriate one from it may be selected in consultation with the Guide. Interpretation of the results should be made in that light. Research quality and completeness is thus ensured.

18.6 Writing and Presentation

All said and done the ultimate form of research that is the written thesis or report matters everything in real life. Writing is an art and can be perfected by practice alone. Revising or rewriting completely the material should be considered as normal. Research writing generally demands simple sentences conveying the precise meaning and not the long winding sentences written in a flowery style. Written communication is supposed to be complete when it is: reached, read, understood, appreciated and acted upon. By and large research writing should meet these goals.

Subject specific Dictionaries and Handbooks should be consulted for writing precisely. Using Thesaurus to determine a shade of word suiting best to the context must be followed. In fact this habit should be inculcated by the researcher to improve the writing. Acronyms or short forms used in the thesis should be explained fully because they can have multiple meanings depending on the subject. For example, “IT” can imply “Information Technology” or “Income Tax” or “International Trade”.

Presentation style whether in writing or oral narration also assumes importance. Reading variety of books, journals and other print and digital material helps a lot in this respect. Similarly exposition to the presentations made by peer delegates at the conferences and seminars guides to develop one’s style. In this regard the technique of preparing effective presentation slides should be mastered by the researcher. Proper choice of the font, font size and colour helps in effective presentation. Balancing the text and graphics in the slides is crucial. Trial of the presentations to different groups can give important suggestions for the improvement. Further it helps in monitoring the time and gives an opportunity to edit the presentation to finish in the time allotted. Ability to mold the writing or presentation according to the audience comes with practice and, therefore, addressing different forums from time to time should be attempted.

Writing gets rusted if not practised. Writing say on an average one page daily about the research topic related matter would help considerably is the submission. This has become more pressing because of the peculiar cryptic style used in digital communication mode like SMS (short messaging service) and e-mail. For honing the art of critical writing, so necessary for research purpose, it is recommended that one should undertake an exercise of book reviewing periodically. For instance, preparing a book review within 1,000 words concisely is a big challenge. It can however sharpen writing and expanding the vocabulary to a great extent. This exercise serves two purposes. Some of those reviews can be sent for publication. Other benefit is that the skill of concise writing would help in preparing the literature review section of the thesis or research report and paper. Writing a letter to the editor of journal, magazine or newspaper periodically also helps in thinking and expressing the views systematically.

It is often forgotten that for good writing wide reading is a prerequisite for most of us. Reading about the subject of research and many other topics always proves beneficial. It helps in increasing the vocabulary, learning better expressions and new terms and appreciating different styles of writing.

Reading of digest magazines is found quite useful because how to write compactly, to the point and still in attention catching manner is the hallmark of their contents.

18.7 Publication

Preparing and submitting the manuscript according to the 'instructions for author' that are given by the journal certainly prove useful. Letter forwarding manuscript should be polite and could highlight the strong or novel points of the paper and why that particular journal was selected for submission. Author is serious in her/his submission should get reflected as far as possible to the editor and his team.

One has to be careful in jointly written paper. On many occasions whose name should appear first becomes a bone of contention. There should be a clear understanding among co-authors about this issue. A copy of the final submitted manuscript should be retained by all the authors for their record.

Acknowledging thanks to those who significantly helped in the research is always welcome. Extending gratitude to the anonymous reviewers whose comments helped in improving the paper is a standard practice. Efforts of the researcher are not belittled by such acknowledgements.

18.8 Persistence

Research is full of uncertainty like any other creative process. So maintaining the patience is valuable. Thinking about the research topic or problem should be carried out continuously. It should be at the back of mind all the time. In other words one must become crazy for it. In that context alertness to note any conversation or say news item that may have some implication on the research theme pays rich dividends. Experience shows that such dedicated efforts do produce fruitful results in due course.

Receiving the rejection slip from the journal about the submitted research paper or article should be taken in the right spirit. It may be noted that papers of the eminent researchers have been rejected in the past and are rejected even today, if they do not meet the standard. Analysing the informed reasons for rejection and improving on those aspects of the research process is the best strategy. Getting dejected and leaving the research on such accounts would not help. The following should be the guideline: "When you receive the praise, look *who* is praising; when you are criticised, look at the *criticism*."

18.9 Research Career and Outlook

Research is a continuous process and people with bend of mind for research make it a life-long mission. However, those who do not want to continue that path should also be aware of unlimited joy hidden in it. Understanding and appreciating it can make the research journey enjoyable; one would never feel research as a boring, mechanical and painful activity.

Building a research career could be pursued irrespective of the subject. Any natural or social phenomenon just happens in real life, but due to human inherent limitations it is looked and examined from a single discipline viewpoint and its tools. It is clear that the solutions based on such limited analysis are partial and not effective in the long run or large number of cases. Conducting multi-disciplinary research is therefore the right approach. In the beginning it may be difficult, however, that should be the aim at a later part of a research career. A contribution of higher order and significance is likely to be made by the researcher by adopting such a strategy.

In any case having gone through research training and rigorous exercise develops an attitude of critical assessment of the facts and figures and drawing conclusions in balanced manner. Similarly working in a research group, both small (say, up to five members) and big, provides a deep insight about collaborative work and group dynamics. Armed with such outlook and experience one can aptly handle most of the tricky situations arising at the work, home or personal level is our belief.

10.10 Peer Reviewing

To be invited by a reputed journal to review a paper should be considered as a reward in itself though, perhaps, no monetary compensation would be forthcoming for the time and effort spent. It is to be viewed as a professional duty helping advancement of knowledge in the subject domain. Accepting such a responsibility is recommended even if that calls for stretching a bit. Usually the journal publishes the names of all the reviewers with thanks in its last issue of the volume and that enhances the prestige of the reviewer. It can be proudly mentioned in the Bio-Data. Several academic and allied opportunities do result from it is our experience.

Reviewing should not be treated as a fault finding mission alone.

While submitting the review report one must put forth all the reasons for the recommendations or observations made. Remarks and suggestions should be constructive as far as possible to facilitate the author to improve and explore further. That could turn out to be of immense benefit, particularly to the young researchers who are starting their research writing career.

18.11 Research Guidance

As one becomes senior he or she is expected to act as a guide or mentor to the new generations of researchers. This duty should be discharged with utmost care and following all the ethical principles and norms. Whatsoever unpleasant past experiences one might have got as a research student must be forgotten and fair treatment should be extended to all the assigned students.

It is also necessary for the Guide to keep in touch with the latest developments in research field like emerging topics, new tools and techniques and writing and presentation styles. Research students must be encouraged to work in upcoming areas so that they will have a good standing in future.

Holding a periodic seminar for the research students is quite useful. Every student will present a summary of own work or that of book or research paper read or give a talk on important issue must be ensured. That helps honing the skills of organising the thoughts and presentation to a considerable extent. Exposing the students to different shades of the research process should be the underlying objective.

18.12 Reporting the Researcher's Experience

Writing about the research encounters is usually resisted on the grounds of the subjectivity. However it is also quite important. Those with the long and varied research experience can provide guidance and a few insights on that basis and everyone will not be writing an autobiography to narrate them. It is now argued that experience of the researcher should not be viewed as marginal to the research and, therefore, should also be reported along with the research results. This assumes a significant importance in many fields like nursing, health care and social work. Those having conducted qualitative research-based studies are rich in such experiences. Quite a few journals and conferences have begun to devote space for such reporting. The researchers should take note of this emerging trend and plan reporting their experiences along with their research or independently to enlighten, particularly the students and new researchers.

Such documented experiences can aid teaching and analysing research settings and their influence on the researchers. Narratives about the sensitive issues hopefully help the other researchers in a number of ways. Writing this experience part could nevertheless be as tough as writing the original research itself. However research practice can benefit considerably in the process is the belief (Refer Sr. No. 34 under the Bibliography for more discussion on this issue for example).

✧✧✧

Bibliography

1. Abdelal, A., Herrera, Johnson, A. I. and McDermott, R. (Eds.), *Measuring Identity – A Guide to Social Scientists*, Cambridge, Cambridge University Press, 2009.
2. Ahuja, R., *Research Methods*, Jaipur, Rawat Publications, 2011.
3. Belke, R., Fischer, E. and Kozinets, R. V. (Eds.), *Qualitative Consumer Marketing Research*, London, Sage Publications, 2013.
4. Bernard, H. R., *Social Research Methods - Qualitative and Quantitative Approaches*, London, Sage Publications, 2013 (2nd edition).
5. Blaikie, N., *Designing Social Research*, Cambridge, Polity Press, 2000.
6. Brew, A., *The Nature of Research: Inquiry in Academic Contexts,* London and New York, Routledge/Falmer, 2001.
7. Bryman, A., *Social Research Methods*, Oxford, Oxford University Press, 2008 (4th edition).
8. Burnett, J., *Doing Your Social Science Dissertation*, London, Sage Publications, 2009.
9. Cairns, P. and Cox, A. L. (Eds.), *Research Methods for Human-Computer Interaction*, Cambridge, Cambridge University Press, 2008.
10. Cargan, L., *Doing Social Research*, Jaipur, Rawat Publications, 2008.
11. Cohen, M. L. and Kent C. O., *Legal Research in a Nutshell,* St. Paul, West Publishing Co., 2000 (7th edition).
12. Cresswell, J. W., *Research Design – Qualitative, Quantitative, and Mixed Methods Approaches*, New Delhi, Sage Publications, 2009 (3rd edition).
13. Czja, R. and Blair, J., *Designing Survey*, London, Sage

Publications, 2005 (2nd edition).

14. Fink, A., *Conducting Research Literature Reviews: From the Internet to Paper*, Los Angeles, California, Sage Publications, 2010 (3rd edition).
15. Flick, U., *Designing Qualitative Research*, London, Sage Publications, 2007.
16. Flick, U., *Introducing Research Methodology*, London, Sage Publications, 2011.
17. Gibbs, G. R., *Qualitative Data Analysis - Explorations with NVivo*, Jaipur, Rawat Publication, 2010.
18. Gravetter, F. J. and Forzano, L-A. B., *Research Methods for the Behavioral Sciences*, Belmount, California, Wadsworth/Thomson Learning, 2006 (2nd edition).
19. Grix, J., *The Foundations of Research*, New York, Palgrave Macmillan, 2004.
20. Hakim, C., *Research Design: Successful Designs for Social and Economic Research*, London, Routledge, 2008.
21. Hammond, M. and Wellington, J., *Research Methods – The Key Concepts*, New York, Routledge, 2013.
22. Henry, G., *Practical Sampling*, London, Sage Publications, 1990.
23. Holliday, A., *Doing and Writing Qualitative Research,* London: Sage Publications, 2007 (2nd edition).
24. Hoover, K. R. and Donovan, T., *The Elements of Social Scientific Thinking,* New York: St. Martin’s Press, 1995 (6th edition).
25. Iphofen, R., *Ethical Decision-Making in Social Research – A Practical Guide*, London, Palgrave Macmillan, 2009.
26. Israel, M. and Hay, L., *Research Ethics for Social Scientists*, London, Sage Publications, 2006.
27. Kish, L., *Survey Sampling*, New York, J. Wiley & Sons, 1995.
28. Marder, M. P., *Research Methods for Science*, Cambridge,

Cambridge University Press, 2011.

29. Machi, L. A. and Mcvoy, B. T., *The Literature Review: Six Steps to Success*, Thousand Oaks, California, Corwin Press, 2009.
30. Martin, P. and Bateson, P., *Measuring Behaviour: An Introductory Guide*, Cambridge, Cambridge University Press, 1986.
31. McConville, M. and Chui, W. H. (Eds.), *Research Methods in Law,* Edinburgh, Edinburgh University Press, 2007.
32. McDavid, J. C. and Hawthorn, L. R. L., *Program Evaluation and Performance Measurement*, London, Sage Publications, 2006.
33. McNabb, D. E., *Research Methods for Political Science*, New Delhi, PHI Learning, 2009.
34. Moch, S. D. and Gates, M. F. (Eds.), *The Researcher Experience in Qualitative Research*, London, Sage Publications, 2000.
35. Neuman, W. L., *Social Research Methods: Qualitative and Quantitative Approaches*, Boston, Allyn and Bacon, 2000 (4th edition).
36. O'leary, Z., *The Essential Guide to Doing Research*, London, Sage Publications, 2004.
37. Oliver, P., *Understanding the Research Process*, London, Sage Publications, 2010.
38. Pagano, R., *Understanding Statistics for the Behavioral Sciences*, London, Wadsworth, 2006 (6th edition).
39. Peterson, R. A., *Constructing Effective Questionnaires*, London, Sage Publications, 2000.
40. Pickard, A. J., *Research Methods in Information*, Chicago, Neal-Schuman, 2013 (2nd edition).
41. Punch, K. F., *Introduction to Social Research: Quantitative and Qualitative Approaches*, London, Sage Publications, 2005.

42. Ridley, D., *The Literature Review*, London, Sage Publications, 2008.
43. Robson, C., *Real World Research*, Oxford, Blackwell, 2002.
44. Saris, W. E. and Gallhofer, I. N., Design, *Evaluation and Analysis for Survey Research*, New York, Wiley-Interscience, 2007.
45. Shamoo, A. and Resnik, D., *Responsible Conduct of Research,* New York, Oxford University Press, 2009 (*2nd edition).*
46. Singh, K., *Quantitative Social Research*, New Delhi, Sage Publications, 2007.
47. Strunk, W. and White, E. B., *The Elements of Style*, Needham Heights, Massachusetts, Allyn and Bacon, 2000 (4th edition).
48. Tashakkori, A. and Teddlie, C. (Eds.), *Handbook of Mixed Methods in the Social and Behavioural Sciences*, Thosand Oaks, California, Sage Publications, 2003.
49. Tuckman, B. W., C*onducting Educational Research*, New York, Harcourt Brace, 1999 (5th edition).
50. Verma, S. K. and Wani, M. A. (Eds.), *Legal Research and Methodology,* New Delhi, Indian Law Institute, 2001.
51. Walliman, N., *Social Research Methods*, London, Sage Publications, 2006.
52. Wayne, W. T., *Biostatistics: A Foundation for Analysis in Health Sciences*, New York, John Wiley & Sons, 2000 (7th edition).
53. Whitehead, J. and Mcniff, J., *Action Research Living Theory*, London, Sage Publications, 2007.
54. Whiteman, N., *Undoing Ethics: Rethinking Practice in Online Research*, London, Springer, 2012.
55. Wolcott, H. F., *Writing Up Qualitative Research*, London, Sage Publications, 1990.

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NUANCES OF THE RESEARCH PROCESS

Contribution to the advancement of knowledge and practice is the noble objective that underlies most of the research in academics. Research can provide new directions for reducing human discomfort and hardship too. Apart from these it can result in accruing monetary benefit as in the case of commercial and consultancy research.

A triggering point to initiate the research can occur from any corner, but to take that idea to a logical end needs systematic efforts. A tightly coupled research process exists for this purpose. To understand the elements and structure of that process is, therefore, necessary irrespective of the topic or subject discipline. This need is addressed effectively by the book.

To perform high quality research and build that tradition is the responsibility of every organisation and individual engaged in the research. Nurturing the research temper is central in this regard. The divide and solve strategy and finer aspects of the research process presented here in simple language provide insights that would serve the researcher working in any field. The research is an enjoyable activity is the message. The contents reflect the rich and wide experience of the author in research and publication.

This is a book that a researcher will want to keep close to hand to refer when engaged in a research enedeavour is its strength.

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